PTO/SB/17 (10-04)

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PATENT & TRADEMARK OFFICE

FEE TRANSMITTAL for FY 2005

Effective 10/01/2004. Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) 130.00

Complete if Known	
Application Number	10/684,060
Filing Date	October 10, 2003
First Named Inventor	Hirezaki, Katsumi
Examiner Name	Unassigned
Art Unit	2661
Attorney Docket No.	16869P-094700US

METHOD OF PAYMENT *(check all that apply)*

☐ Check ☐ Credit Card ☐ Money Order ☐ Other ☐ None

☒ Deposit Account:

Deposit Account Number	20-1430
Deposit Account Name	**Townsend and Townsend and Crew LLP**

The Director is authorized to: *(check all that apply)*

☒ Charge fee(s) indicated below ☒ Credit any overpayments

☒ Charge any additional fee(s) or any underpayment of fee(s)

☐ Charge fee(s) indicated below, **except for the filing fee**

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FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1001	790	2001	395	Utility filing fee	
1002	350	2002	175	Design filing fee	
1003	550	2003	275	Plant filing fee	
1004	790	2004	395	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	
				SUBTOTAL (1)	($)0.00

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

			Extra Claims		Fee from below		Fee Paid
Total Claims		-** =		X		=	
Independent Claims		-** =		X		=	
Multiple Dependent				X		=	

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	88	2201	44	Independent claims in excess of 3
1203	300	2203	150	Multiple dependent claim, if not paid
1204	88	2204	44	** Reissue independent claims over original patent
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($)0.00

***or number previously paid, if greater; For Reissues, see above*

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet.	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for *ex parte* reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	430	2252	215	Extension for reply within second month	
1253	980	2253	490	Extension for reply within third month	
1254	1,530	2254	765	Extension for reply within fourth month	
1255	2,080	2255	1,040	Extension for reply within fifth month	
1401	340	2401	170	Notice of Appeal	
1402	340	2402	170	Filing a brief in support of an appeal	
1403	300	2403	150	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive – unavoidable	
1453	1,330	2453	665	Petition to revive – unintentional	
1501	1,370	2501	685	Utility issue fee (or reissue)	
1502	490	2502	245	Design issue fee	
1503	660	2503	330	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	130
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	790	2809	395	Filing a submission after final rejection (37 CFR § 1.129(a))	
1810	790	2810	395	For each additional invention to be examined (37 CFR § 1.129(b))	
1801	790	2801	395	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

Other fee (specify)________________

*Reduced by Basic Filing Fee Paid **SUBTOTAL (3)** ($)130.00

SUBMITTED BY Complete *(if applicable)*

Name (Print/Type)	Chun-Pok Leung	*Registration No. (Attorney/Agent)*	41,405	*Telephone*	650-326-2400
Signature				*Date*	November 15, 2004

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PATENT
Attorney Docket No.: 16869P-094700US
Client Ref. No.: 340300257US01

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

KATSUMI HIREZAKI et al.

Application No.: 10/684,060

Filed: October 10, 2003

For: CONTROL METHOD OF STORAGE SYSTEM, STORAGE SYSTEM, AND STORAGE APPARATUS

Customer No.: 20350

Examiner: Unassigned

Technology Center/Art Unit: 2661

Confirmation No.: 5249

PETITION TO MAKE SPECIAL FOR NEW APPLICATION UNDER M.P.E.P. § 708.02, VIII & 37 C.F.R. § 1.102(d)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This is a petition to make special the above-identified application under MPEP § 708.02, VIII & 37 C.F.R. § 1.102(d). The application has not received any examination by an Examiner.

(a) The Commissioner is authorized to charge the petition fee of $130 under 37 C.F.R. § 1.17(i) and any other fees associated with this paper to Deposit Account 20-1430.

11/19/2004 AWONDAF1 00000054 201430 10684060
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(b) All the claims are believed to be directed to a single invention. If the Office determines that all the claims presented are not obviously directed to a single invention, then Applicants will make an election without traverse as a prerequisite to the grant of special status.

(c) Pre-examination searches were made of U.S. issued patents, including a classification search, a foreign patent database search, and a literature search. The searches were performed on or around October 15, 2004, and were conducted by a professional search firm, Mattingly, Stanger & Malur, P.C. The classification search covered Class 713 (subclasses 1, 300, 310, 323, and 340) and Class 714 (subclass 14). Because of the large size of these subclasses, keywords were used to narrow of number of documents returned. The foreign patent database search was conducted using Espacenet in international subclass G06F1/26, directed to power supply means, e.g., regulating of, for data processing equipment. The literature search was performed using DIALOG online databases. The inventors further provided four references considered most closely related to the subject matter of the present application (see references #7-10), which were cited in the Information Disclosure Statement filed on October 10, 2003.

(d) The following references, copies of which are attached herewith, are deemed most closely related to the subject matter encompassed by the claims:

(1) U.S. Patent No. 5,745,391;

(2) U.S. Patent No. 5,835,780;

(3) U.S. Patent No. 6,415,387 B1;

(4) U.S. Patent Publication No. 2004/0068672 A1;

(5) U.S. Patent Publication No. 2004/0111596 A1;

(6) European Patent Publication No. EP 1302840 A2;

(7) U.S. Patent Publication No. 2002/0087899 A1;

(8) U.S. Patent No. 6,389,546;

(9) Japanese Patent Publication No. JP 2002-135974; and

(10) Japanese Patent Publication No. JP 2002-006998.

(e) Set forth below is a detailed discussion of references which points out with particularity how the claimed subject matter is distinguishable over the references.

A. Claimed Embodiments of the Present Invention

The claimed embodiments relate to controlling power supply to storage devices.

Independent claim 1 recites a storage system including an information processing device having a first power supply which activates a function for transmitting at least one of a data input and output request, and a storage device connected to communicate with the information processing device having a second power supply which activates a function for accepting the at least one of the data input and output request transmitted from the information processing device. A method of controlling the storage system comprises, when the second power supply is turned on and the storage device can accept the at least one of the data input and data output request transmitted from the information processing device, the storage device transmitting a power-on request for turning on the first power supply to the information processing device.

Independent claim 2 recites a method for a controlling a storage system, the storage system including an information processing device having a first power supply which activates a function for transmitting at least one of a data input and a data output request, and a plurality of storage devices connected to communicate with the information processing device, each storage device having a second power supply which activates a function for accepting the data input and output request which is transmitted from the information processing device. The method comprises connecting the storage devices to communicate with each other; from a first storage device transmitting a power-on request for turning on the second power supply to a second storage device, when the second power supply of the first storage device is turned on; the first storage devices receiving from the second storage device a notification that the second storage device can accept the data input and data output request being transmitted from the information processing device; and the first storage devices transmitting a power-on request for turning on the first power supply to the information processing device when the second storage device can accept the data input and data output request being transmitted from the information processing device.

Independent claim 4 recites a method of controlling a storage system including an information processing device having a first power supply which activates a function for transmitting a data input and output request; and a storage device connected to communicate with the information processing device having a second power supply which activates a function for accepting the data input and data output request transmitted from the information processing device. The method comprises, when the storage device accepts a stop instruction of the second power supply, the storage device transmitting a stop-power request for turning off the first power supply to the information processing device.

Independent claim 6 recites a control method of a storage system comprising a plurality of information processing devices each having a first power supply which activates a function for transmitting a data input and data output request and a storage device connected to communicate with the plurality of information processing devices through a network, having a second power supply which activates a function for accepting the data input and data output request which is transmitted from the information processing device. The method comprises, the storage device transmitting a power-on request for turning on the first power supply to all of the information processing devices, when the second power supply is turned on and the storage device can accept the data input and data output request being transmitted from the information processing device; the information processing device turning on the first power supply when the information processing device receives the power-on request for turning on the first power supply from the storage device; the information processing device notifying a network address on the network which is given to the information processing device, to the storage device when the first power supply is turned on and the information processing device enters into such a situation that the information processing device can transmit the data input and output request; the storage device storing the network address when the storage device receives the network address from the information processing device; and the storage device transmitting a power-stop request for stopping the first power supply to the information processing device to which the stored network address is given, in case that a stop instruction of the second power supply was applied to the storage device.

Independent claim 7 recites a method of controlling a storage system including a plurality of information processing devices each having a first power supply which activates a function for transmitting a data input and data output request and a storage device connected to the plurality of information processing device to communicate with each other through a network, having a second power supply which activates a function for accepting the data input and data output request transmitted from the information processing device. The method comprises, the storage device transmitting a power-on request for turning on the first power supply to all of the information processing devices, when the second power supply is turned on and the storage device enters into such a situation that the storage device can accept the data input and output request being transmitted from the information processing device; the information processing device turning on the first power supply when the information processing device receives the power-on request for turning on the first power supply from the storage device; the information processing device notifying a network address on the network which is given to the information processing device, to the storage device when the first power supply is turned on and the information processing device enters into such a situation that the information processing device can transmit the data input and output request; the storage device storing the network address when the storage device receives the network address from the information processing device; and the storage device transmitting a power-on request for turning on the first power supply to the information processing device to which the stored network address is given, when the second power supply is turned on and the storage device enters into such a situation that the storage device can accept the data input and output request being transmitted from the information processing device.

Independent claim 8 recites a storage system comprising an information processing device having a first power supply which activates a function for transmitting a data input and output request; and a storage device connected to the information processing device in such a manner that the storage device and the information processing device can communicate with each other, having a second power supply which activates a function for accepting the data input and output request which is transmitted from the information processing device. The storage device includes means for transmitting a power-on request for turning on the first power supply to the information processing device, when the second

One of the benefits that may be derived is that when the power supply of the storage device is turned on, the storage device enters a state where it can accept the data input and output requests transmitted from the information processing device. After that, the power supply of the information processing device is turned on enabling control of the power supply of the storage device and the power supply of the information processing device in an interlocked manner. When the storage device accepts the stop instruction, the power supply of the information processing device is stopped, and then the power supply of the storage device is stopped.

B. Discussion of the References

None of the following references disclose an information processing device having a first power supply and a storage device having a second power supply, wherein the storage device transmits power-on and power-off requests to the power supply of the information processing device.

1. U.S. Patent No. 5,745,391

This reference discloses an apparatus and method for turning on and off a computer. On and off commands may be received from a remotely-located central controller. Thus, the reference discloses on/off commands traveling across a network, but it does not teach that an information processing device has a first power supply and a storage device has a second power supply, and the storage device transmits power-on and power-off requests to the power supply of the information processing device.

2. U.S. Patent No. 5,835,780

This reference discloses a method for controlling power supply during service interruption. Upon detection of service interruption, a power supply unit gives notice to a processor to instruct save operations from a memory unit to a storage device, then instructs power disconnection to a second power supply, and continues power supply to the memory unit and storage device for save operation. However, the reference does not teach that an information processing device has a first power supply and a storage device has a second power supply, and the storage device transmits power-on and power-off requests to the first power supply of the information processing device.

3. U.S. Patent No. 6,415,387 B1

This reference discloses a network computer configured to enter a low-power state in response to a low-power event, and further configured to transition from a low-power state to a full-power state in response to a wake-up event. The wake-up event may comprise a LAN wake-up command issued by a server computer. Thus, the reference discloses wake-up signals sent between two computers on a network, but not a storage device that transmits power-on and power-off requests to the power supply of an information processing device.

4. U.S. Patent Publication No. 2004/0068672 A1

This reference discloses a controller that manages distribution of power to storage devices. The controller can cause storage devices to power on and off. However, the reference does not teach a storage device that transmits a power-on request for turning on a power supply of an information processing device.

5. U.S. Patent Publication No. 2004/0111596 A1

This reference relates to a power conservation system that may be used over a SAN. Resources may be partitioned for controlling power supplies, and power may be turned off to unallocated or unused disk drives. However, the reference does not teach the method or system of the present invention in which a storage device transmits a power-on request for turning on the power supply of an information processing device.

6. European Patent Publication No. EP 1302840 A2

This reference discloses a computer network in which a representative computer notifies other computers of the next power-up time whenever a power-down request arrives. Each computer has a power supply control device that stores the power-up time. When the power-up time arrives, the representative computer is powered up by its own power supply control device and instructs each power supply control device of the other computers to power up. Thus, the reference discloses sending power-up instructions over a network, but does not teach a storage device that transmits a power-on request for turning on the power supply of an information processing device.

7. U.S. Patent Publication No. 2002/0087899 A1

This reference discloses an information storage apparatus including an uninterruptible power supply (UPS). A sequence of operation from when a power failure occurs to when power of the UPS is turned off is automatically accomplished completely without human power to thereby guarantee user data. For this purpose, the apparatus includes a disk array, a host, and a plurality of UPSs to supply power to the disk array and the host. The UPSs monitor a state change of power on a host side by a host ac control line or an SCSI unit to sequentially execute processing in an order of processing of host termination, processing for cache flush of the disk array, processing of host UPS termination, processing of host UPS termination, processing of disk array termination, and processing for termination of disk array UPS. Between the UPSs and the host and between the UPSs and the disk array, there is provided an interlocking control signal to monitor current states thereof so as to control the respective operations.

8. U.S. Patent No. 6,389,546

This reference contains the same disclosure as reference #7.

9. Japanese Patent Publication No. JP 2002-135974

This reference discloses a way to supply power to plural accessory electronic devices by using a small power supply. The electronic device has a main power supply which can drive plural accessory devices at the same time, power supply terminals for those devices, a control means to supply power to the plural accessory devices through the power supply terminals, and an interface to communicate with the outside. To start the above plural accessory devices using the main power supply, an instruction is given to shift each start timing for those accessory devices through the interface. Receiving the start confirmation signals from the accessory devices, or after the time elapses longer than predetermined, the main power supply starts to supply power to the next accessory device. Thus, by shifting the power supply start timing, the main power supply can be used even if its capacity is small.

10. Japanese Patent Publication No. JP 2002-006998

This reference discloses an electric power supply controller to control exactly the supply of power of interdependent enclosures of an information processing unit that includes plural connected enclosures regardless of the number and combination of enclosures. In an information processing unit that makes up a system by connecting plural enclosures including CPU enclosures 1 and 2, and I/O enclosure 1-6, and a HDD enclosure 1-b, the supply of power is controlled efficiently for peripheral device enclosures including: an I/O enclosure 1-6 that is dependent on power supply condition of CPU enclosure 1 and 2, and a HDD enclosure 1-b by installation of a bus 1-5 that connects each enclosure to be connected, communication control circuits 1-3, 1-4, 1-9, and 1-e that are workable under the off status of power supply (standby status of power supply), the power supply status memory circuits 1-8 and 1-d that can store the power supply information on the enclosures other than itself collected by communication control circuits 1-9 and 1-e, and power control circuits 1-7 and 1-c.

(f) In view of this petition, the Examiner is respectfully requested to issue a first Office Action at an early date.

Respectfully submitted,

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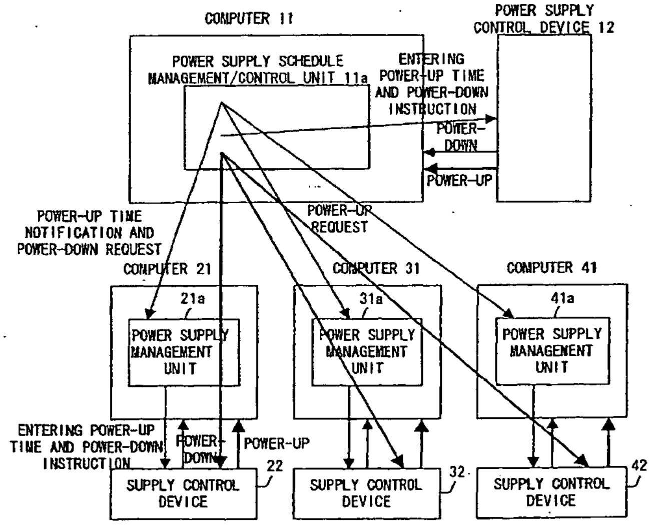
(54) Power supply control in network

(57) In a computer network, a representative computer (11) requests performing a power-down process to the other computers (21, 31, 41) and notifies the other computers of a next power-up date and time whenever a power-down date and time arrives. Each computer has a power supply control device (12, 22, 32, 42) which stores the power-up date and time. Each time a power-up date and time comes, the representative computer (11) is powered up and activated by its own power supply control device (12) and normally instructs each power supply control device (22, 32, 42) of the other computers. However, if the representative computer (11) cannot be activated for any reason, each power supply control device (22, 32, 42) powers up its own computer at the stored power-up date and time.


COMPUTER 11
POWER SUPPLY CONTROL DEVICE 12
POWER SUPPLY SCHEDULE MANAGEMENT/CONTROL UNIT 11a
ENTERING POWER-UP TIME AND POWER-DOWN INSTRUCTION
POWER-DOWN
POWER-UP
POWER-UP TIME NOTIFICATION AND POWER-DOWN REQUEST
POWER-UP REQUEST
COMPUTER 21
COMPUTER 31
COMPUTER 41
21a
31a
41a
POWER SUPPLY MANAGEMENT UNIT
POWER SUPPLY MANAGEMENT UNIT
POWER SUPPLY MANAGEMENT UNIT
ENTERING POWER-UP TIME AND POWER-DOWN INSTRUCTION
POWER-DOWN
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22
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SUPPLY CONTROL DEVICE
SUPPLY CONTROL DEVICE
SUPPLY CONTROL DEVICE

F I G. 3

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Description

[0001] The present invention relates to a centralized management/control method for the power ON/OFF schedule of a plurality of computers in a system in which the plurality of computers are connected via a network.

[0002] Conventionally, the power of a computer (such as a server in a network) is automatically turned ON/OFF according to a predetermined schedule in an automatic power supply control method. This method is used to make the computer carry out a series (schedule) of operating jobs from power-up to the activation and completion of an application, and saves the labor and resources required to operate the computer (automatic operation).

[0003] FIG. 1 shows a conventional automatic power supply control method.

[0004] With the configuration shown in FIG. 1, a power supply control device 102 is connected to a single computer 101. The power supply control device 102 can be an exclusive device (standalone device), and can be configured to have the function of controlling the power supply by, for example, a UPS (uninterruptible power supply, also referred to as a standby power supply device), etc.

[0005] The computer 101 is provided with power supply scheduling software 103. When a user optionally operates an input device (keyboard, mouse, etc.) of the computer 101 not shown in the attached drawings, and activates the power supply scheduling software 103, a settings input screen (not shown in the attached drawings) of a power supply schedule is displayed. On the settings input screen, the user defines (inputs the settings of) a power supply schedule (power-up date and time, shutdown/power-down date and time, etc.) or a 'wait event' for extending the shutdown.

[0006] The 'wait event' refers to a state to be reached before the computer 101 can safely shut down. For example, an operation job is terminated, a database is completed, etc. Therefore, if the 'wait event' has not occurred by the power-down date and time, then it is necessary to extend the power-down date and time without performing the shutdown process. An example of the above mentioned 'wait event' can be an 'end of operation job' and an 'end of database' because the computer 101 is not necessarily operated by a person, but automatically continues executing jobs according to a predetermined job schedule during its operating time. However, it is not limited to these applications.

[0007] The above mentioned power supply schedule can be set for several weeks or months, and for a plurality of dates and times.

[0008] After the above mentioned settings are input, the power supply schedule software 103 enters a wait state until the earliest date and time for shutdown/power-down. When this power-down date and time arrives, the power supply control device 102 is instructed to indicate the next power-up date and time and perform a shut down process in several minutes according to the defined power supply schedule, unless it is necessary to extend the power-down date and time until after it is confirmed that the 'wait event' has occurred. Furthermore, the OS (operating system) of the computer 101 is instructed to perform a shutdown process. The power-down process may be delayed by up to several minutes, to prevent the power-down from being performed before the completion of the shutdown.

[0009] Thus, the OS of the computer 101 is shut down, and then the power-down process is performed by the power supply control device 102. The power supply control device 102 obviously stores the indicated next power-up date and time in its internal memory, or the like.

[0010] Then, at the next stored power-up date and time, the power supply control device 102 performs the power-up process such as energizing, etc. Through the power-up, the computer 101 can be activated.

[0011] As described above, although there has been a conventional management system for an automatic power supply schedule of a single computer, there has been no management system for an automatic power supply schedule of a system involving a plurality of computers. A system involving a plurality of computers refers to, for example, a client/server system, and specifically a system in which the plurality of computers perform a formatted job in cooperation with one another according to the schedule of a predetermined job. In this system, it is desired that the processes of power-up, system activation, activation of a job application, stopping the job application, shutdown, and power-down can be automatically operated by calendar control. In addition, for example, there are some multiserver systems for allowing large amounts of access at several sites on the Internet. In such a multiserver system, an automatic power supply schedule management system is needed to perform the power-down process when a power supply ON/OFF scheduling process is performed on each server each week (for example, to stop the operation on Sundays, etc.), during the periodic maintenance, at the beginning and the end of a year, etc.

[0012] The following methods 1 and 2 have been conceived for automatic power supply scheduling of a system involving a plurality of computers.

(Method 1)

[0013] The management system for an automatic power supply schedule of a single computer is applied as is. That is, each computer is provided with its own power supply control device 102 and the power supply schedule software 103 for individual management of the power supply schedule.

(Method 2)

[0014] This method is described below by referring to

FIG. 2.

[0015] In FIG. 2, a plurality of computers 111, 121, 131, and 141 are provided with power supply control devices 112, 122, 132, and 142. They are connected to a network (not shown) and can communicate with one another.

[0016] One of the plurality of computers 111 to 141 is chosen as a representative computer, and the representative computer collectively manages/controls the power supply ON/OFF scheduling of all the computers including itself. In the example shown in FIG. 2, the computer 111 is the representative computer.

[0017] The representative computer 111 comprises a power supply scheduling unit 111a which collectively manages/controls the power ON/OFF scheduling (to be defined by a manager, etc.) for all the computers. That is, the power supply scheduling unit 111a requests the other computers 121 through 141 to perform the power-down process each time a defined power-down date and time is received according to a predetermined schedule. Correspondingly, each of the computers 121, 131, and 141 instructs its power supply control device 122, 132, or 142 to perform the power-down process and power itself down. Then, the power supply scheduling unit 111a notifies its own power supply control device 112 of the next power-up date and time, instructs it to enter (store) that date and time, performs the power-down process, and powers itself down.

[0018] When an entered power-up date and time comes, the power supply control device 112 powers up the computer 111. Thus, when the computer 111 is activated, the power supply scheduling unit 111a instructs the power supply control devices 122, 132, and 142 of the other computers to perform the power-up process. Thus, each of the computers 121, 131, and 141 is powered up.

[0019] There have been the following problems (a) through (c) with the above mentioned method 1.

> (a) Since a power supply schedule has to be defined/managed in each computer, the setting/amending operations for the power supply schedule increase, thereby inviting human error. Especially when the power-up/power-down timings of computers are related to one another (when it is necessary to perform the power-up/down processes in a specific order, for example, when it is necessary to first activate a printer server among a plurality of servers on startup), different power-up times need to be set, and it is not sufficient to generate a single power supply schedule and copy it for all computers.
>
> (b) Typically, the clock function built in to each computer and power supply control device is imprecise and invites errors. That is, unless the clock built in to each computer and supply control device substantially match each other, there can be inconsistency regarding activation/disconnection. For example, assume that there are computers A and B, the computer B is to be activated after the computer A, and the startup time of the computer A is 6:30 and the startup time of the computer B is 6:32. If the clock of the computer B is 3 minutes fast, then the computer B is first activated, thereby disordering the activation sequence.
>
> (c) The 'wait event' for extension of the shutdown process is intended only for the local device, but not for other devices. Therefore, for example, among the systems working in cooperation with one another, even if the shutdown of one computer is extended, if the resources of another computer are to be used, there is the possibility of an error due to shutdown of the other computer.

[0020] On the other hand, there is a similar problem to above-mentioned problem (c) with the above mentioned method 2.

[0021] Furthermore, in the method 2, when the computer 111 fails to be activated for any reason, there is the risk that the other computers also cannot be activated.

[0022] The present invention aims at providing a supply control method for a plurality of information processing devices, for use with a configuration in which the automatic power supply ON/OFF schedules of a plurality of computers are collectively managed/controlled by a representative computer, capable of activating computers even if the representative computer becomes faulty, and performing startup/power-down process in a specific order despite possible errors, etc. in the clock.

[0023] In the supply control methods for a plurality of information processing devices according to the present invention, the first method is a power supply control method for use in a system in which a power supply control device is provided for each of the information processing devices connected to a network. An arbitrary one of the plurality of information processing devices instructs each power supply control device of the other information processing devices to perform a power-up process each time it is activated according to a predetermined power-up/down schedule of itself and the other information processing devices, notifies the other information processing devices of the next power-up date and time together with a power-down instruction each time a power-down date and time comes, and allows each power supply control device to enter (store) the next power-up date and time. When the power supply control device of each other information processing device receives the power-up instruction or the entered power-up date and time comes, it performs the power-up process.

[0024] The second method is likewise for use in a system in which a power supply control device is provided for each of the information processing devices connected to a network. An arbitrary one of the plurality of information processing devices instructs each power supply control device of the other information processing devices to perform a power-up process each time it is activated according to a predetermined power-up/down schedule of itself and the other information processing devices, notifies each power supply control device of the other information processing devices of the next power-up date and time and has it enter the date and time each time a power-down date and time comes, and issues a power-down instruction to each information processing device. When the power supply control device of each other information processing device receives the power-up instruction or the entered power-up date and time comes, it performs the power-up process.

[0025] In the above mentioned first or second method, preferably, the power supply control device of each other information processing device enters the next power-up date and time in the power-down process so that the other information processing devices can be activated even when a power-up instruction is not issued because an abnormal condition, for example, in which any information processing device cannot be activated for any reason, occurs when the next power-up date and time comes.

[0026] Furthermore, for example, the next power-up date and time given to each power supply control device of the other information processing devices can be the date and time obtained by any information processing device or each information processing device adding any margin to the power-up date and time in the power-up/down schedule set in advance.

[0027] Thus, for example, if the clock of each power supply control device of the other information processing devices is a little fast (or slow), the power-up process can be performed when there is no power-up instruction even after, for example, about ten minutes have passed from the original power-up date and time. Thus, when the representative information processing device is normally activated, the problem that the system is activated earlier than a scheduled date and time and the defined activation order cannot be guaranteed, can be avoided.

[0028] Reference is made, by way of example only, to the accompanying drawings in which:

FIG. 1 shows the conventional automatic supply control method;

FIG. 2 shows a conventional example of the system for performing an automatic power supply schedule for a plurality of computers;

FIG. 3 is a general view of the system for performing an automatic power supply schedule of a plurality of computers;

FIG. 4A shows the definition of an automatic power supply schedule;

FIG. 4B shows an example of a supply control target computer-defined file;

FIG. 5 shows an example of a schedule definition setting screen;

FIG. 6 shows an example of a setting screen used by a user defining the name of a computer to be controlled in synchronization;

FIG. 7 is a flowchart for explanation of an example of a power-down process;

FIG. 8 is a flowchart for explanation of a normal power-up process;

FIG. 9 is a flowchart for explanation of an abnormal power-up process;

FIG. 10 shows a general view of the flow of a power-up/down process based on the definition sample shown in FIG. 4A;

FIG. 11 is a flowchart for explanation of another example of the power-down process;

FIG. 12 shows an example of the hardware configuration of a computer; and

FIG. 13 shows an example of a storage medium.

[0029] The embodiments of the present invention are described below by referring to the attached drawings.

[0030] FIG. 3 is a general view of a system for performing an automatic power supply schedule of a plurality of computers embodying the present invention. FIG. 3 shows a system in which computers 11, 21, 31, and 41 are connected to a network (LAN, etc.) not shown in the attached drawings. Each of power supply control devices 12, 22, 32, and 42 is also connected to the network. The communications between computers, or between the computer 11 and each of the supply control devices 22, 32, and 42, through the network are performed through, for example, an Ethernet protocol.

[0031] First, any one of the plurality of computers 11 through 41 is chosen to be a representative computer, and the representative computer is allowed to collectively manage/control the automatic power ON/OFF schedule of its own and other computers. In FIG. 3, the computer 11 is the representative computer.

[0032] The computer 11 comprises a power supply schedule management/control unit 11a, and collectively manages/controls its own power supply schedule (date and time on which the power is turned ON/OFF) as well as that of the other computers 21, 31, and 41.

[0033] The power supply schedule management/control unit 11a requests the other computers 21, 31, and 41 to power down each time the power-down date and time comes according to a predetermined power supply schedule. At this time, the next power-up date and time is notified. Upon receipt of the notification, power supply management units 21a, 31a, and 41a of each of the computers 21, 31, and 41 have their own supply control devices 22, 32, and 42 enter the power-up dates and times, and instruct them to perform the power-down process. Thus, the supply control devices 22, 32, and 42 power down the computers 21, 31, and 41 respectively. In addition, the power supply schedule management/control unit 11a of the computer 11 has the supply control device 12 enter the power-up date and time, and instructs it to perform the power-down process. Thus, the supply control device 12 powers down the computer 11.

[0034] The power-up date and time entered by the supply control device 12 is set such that the supply control device 12 can be powered up a little earlier than the other supply control devices 22, 32, and 42. Thus, the power-up date and time entered in the supply control device 12 comes first, and the supply control device 12 powers up the computer 11. Once the computer 11 is activated, the power supply schedule management/control unit 11a then requests each of the supply control devices 22, 32, and 42 to perform the power-up process. Thus, the supply control devices 22, 32, and 42 power up the computers 21, 31, and 41 respectively.

[0035] If the computer 11 cannot be activated for any reason, then the supply control devices 22, 32, and 42 power up the computers 21, 31, and 41 respectively when the entered power-up date and time is reached during the power-down state.

[0036] Thus, in the automatic power supply scheduling method according to the present invention, the risk that the other computers 21, 31, and 41 cannot be powered up can be avoided even if the representative computer 11 cannot be activated. For example, in a system in which a formatted job process is performed by a plurality of computers, if one computer cannot be activated, another computer can replace that computer, thereby preventing trouble.

[0037] In the above explanation, the representative computer 11 starts the power-down process as soon as the power-down date and time comes, but the power-down process can be delayed until an 'event' predetermined for all computers including the computer 11 has occurred even after the power-down date and time has arrived (such that the shutdown can be extended) Furthermore, each computer can be set to be powered down or up at predetermined time intervals. The details are described later.

[0038] FIG. 4 shows the definition of the automatic power supply schedule.

[0039] A schedule definition 50 shown in FIG. 4 comprises a startup/power-down time 51, a computer name 52 to be controlled in synchronization, and an event name 53 awaiting the shutdown.

[0040] Although the same startup/power-down time 51 is defined every day in this example (startup at 6:00 and power-down at 20:00), the settings are not limited to these values. For example, it can be newly set every week as on a schedule definition setting screen 60 shown in FIG. 5, and can be configured, and also can be newly set every day.

[0041] In the example shown on the schedule definition setting screen 60 in FIG. 5, an operation time setting area 61, an 'operation' button 62, an 'OFF' button 63, a 'reboot' button 64, etc. can be displayed. For example, when a user, etc. specifies a desired operation time period, he or she specifies a desired time period in the operation time setting area 61 after specifying the 'operation' button 62. Similarly, a shutdown time period and a reboot time can be specified by operating the 'OFF' button 63 and the 'reboot' button 64 respectively. In the example shown in FIG. 5, the system is activated at 6:00 and powered down at 20:00 on Monday, Tuesday, and Thursday every week. For example, on Saturday, the system is set to be activated at 6:00, suspended at 12:00, then activated again at 16:00, and powered down at 20:00.

[0042] Each computer name 52 to be controlled in synchronization is formed by a computer name 52a (which can be an identifier such as an ID, etc.), a startup interval 52b, a power-down interval 52c, and an IP address 52d of the supply control device in this example.

[0043] The computer names 52a are linked with one another (including the computer 11). For example, the name, the identifier, etc. of a computer for performing a formatted job process, etc. are defined. Thus, it is desired that a plurality of computers linked with one another are also linked in the power ON/OFF control. In the present embodiment, the computers 21, 31, and 41 are entered as the computers which are linked in control, and are collectively managed/controlled in the power ON/OFF process by the computer 11 (the computers can be hereinafter referred to as a 'target computer').

[0044] The startup interval 52b is defined when the computers 21, 31, and 41 are to be activated in order at arbitrary time intervals. The power-down interval 52c is similarly defined. Therefore, they are not necessarily defined.

[0045] The computers are activated in order from top to bottom. In the example shown in FIG. 4A, after the computer 11 is activated, the computers 21, 31, and 41 are activated in this order. On the other hand, they are powered down in order from the computers 41, 31, and 21.

[0046] The startup interval 52b = '3 minutes' for the computer 21 means that the computer 31 is activated 3 minutes after the computer 21 is activated. Similarly, the computer 41 is set to be activated two minutes after the computer 31 is activated. Since no computer is activated after the computer 41, the startup interval 52b is not set for the computer 41.

[0047] As for the power-down intervals, the computer 31 (also the computer 21 in this example) is set to be powered down one minute after the computer 41 is powered down. Intervals are not necessarily set among the computers for the startup/power-down process. If they are not set, '0 minute' is set as shown in FIG. 4A.

[0048] FIG. 4A shows only an example. For example, the startup interval 52b = '3 minutes' for the computer 21 means that the computer 21 is activated 3 minutes after the computer 11 is activated (in this case, the startup interval 52b for the computer 41 is also to be set).

[0049] In addition, the IP address assigned to each supply control device is defined to the IP address 52d of the supply control device. Normally, although the IP address of each of the computers 11 through 41 is entered (since it is a matter of fact, it is not specifically shown or described), the IP address of the supply control device itself is not entered. Therefore, it is defined below.

[0050] The representative computer 11 can issue a power-up instruction, a power-down instruction, etc. directly to each supply control device using the IP address 52d of the supply control device.

[0051] The set contents are stored in a supply control target computer definition file 54 as shown in FIG. 4B. In FIG. 4B, for example, 'COMPUTERB' is an example of an actual computer name (or identifier) of the computer 21. In addition, although not shown in the attached drawings, a definition file for correspondence between the IP address of each computer and the computer name is also stored.

[0052] FIG. 6 shows an example of a setting screen for allowing a user to define the computer names 52 to be controlled in synchronization.

[0053] On a setting screen 70, the user first specifies, for example, an 'add' button 72, a 'change' button 73, etc. and then sets/inputs the name of the host to be power-controlled, the startup interval, the power-down interval, the IP address 52d of the UPS (supply control device), etc. in a setting input area 71. The unit of the values of the startup interval and the power-down interval is 'second'.

[0054] In FIG. 4, a condition name (in the example shown in FIG. 4, the end of the database, the end of the operation job, and other information such as waiting for the output of the printer, etc.) indicating that it is time to enter a power-down state is entered for each computer in an event name 53 which is waiting for shutdown. Although not shown in the attached drawings or described in detail, a 'waiting event name' of the user's computer (representative computer) is also entered as in the conventional technology.

[0055] Thus, according to the present embodiment, by entering the 'waiting event name' of not only the representative computer but also other computers to be power ON/OFF controlled in synchronization, the shutdown process is not performed until a 'waiting event' occurs in all computers (until it is time to enter a shutdown state) although the power-down date and time has come. That is, a 'wait event' refers to also a power-down permission condition.

[0056] FIG. 7 is a flowchart for explanation of an example of a power-down process in the system shown in FIG. 3.

[0057] FIG. 7 shows only one computer 21 (and its supply control device 22) as another computer which is managed/instructed by the representative computer 11 for its power supply schedule. However, similar processes are performed on other computers 31 and 41, and the same applies to Figs. 8 to Fig. 11.

[0058] In FIG. 7, when a predetermined event (the event name 53 waiting for shutdown) occurs during its operation, the computer 21 (likewise computers 31 and 41) notifies the representative computer 11 of this (step S31).

[0059] Although not shown in FIG. 7, upon receipt of the notification, the computer 11 temporarily records that the event has occurred in the computer 21.

[0060] The computer 11 normally performs its own job process, etc. until a predetermined power-down time comes (NO in step S11), and temporarily stores it each time another computer notifies the computer 11 of the occurrence of an event (or when an event occurs in the computer 11). At the power-down time, the computer 11 determines whether or not events have occurred (been completed) in all computers. If not (NO in step S11), the computer 11 waits until the events have been completed (extends the shutdown).

[0061] If the power-down time has come, and the events have been completed in all computers (YES in step S11), then the power-down process described below is performed.

[0062] The processes are not limited to the above mentioned example. For example, the power-down process can be started at the power-down time without considering the completion of an event. If a new process occurs after receipt of the notification of the occurrence of an event in another computer, then a notification of the deletion of the occurrence of the event is issued, and a notification of the occurrence of the event is issued again upon completion of the new process. Otherwise, if the power-down time has come, not when another computer issues an event occurrence notification by itself, then the computer 11 can issue an inquiry to another computer.

[0063] First, the computer 11 refers to a startup/power-down time 51 and a computer name 52 to be controlled in synchronization in the above mentioned schedule definition 50, and obtains the next power-up time of each computer for managing a power supply schedule (step S12). In the example shown in FIG. 4A, the power-up time is 6:00 for the computers 11 and 21, 6:03 for the computer 31, and 6:05 for the computer 41.

[0064] Then, the processes in steps S14 to S16 are performed on all computers to be managed for power supply schedules (step S13).

[0065] That is, an appropriate margin (predetermined by an operator, etc., or optionally determined by a computer, and assumed to be 10 minutes in the present embodiment) is allowed for the next power-up time obtained in step S12 for a target computer (step S14). That is, the next power-up time is given in step S15 for use in case the computer 11 cannot be activated. For example, when the supply control device 32 of the computer 31 enters '6:03' as the next power-up time, the supply control device 32 can activate the computer 31 before the computer 11 instructs it to perform the power-up process for any reason (for example, the clock is a little fast) although the computer 11 is normally activated. To avoid such an error (the power-up process cannot be performed in the defined order), an appropriate margin is allowed.

[0066] The processes in steps S14 and S33 need not be simultaneously performed. That is, the process of allowing a margin for the next power-up time can be performed by the representative computer 11 or each of the computers 21, 31, and 41 whichever can be predetermined before a program is generated.

[0067] In addition, the processes in steps S14 and S33 are not necessarily required. For example, if a value of a predetermined power-up/down interval includes an allowed margin, they are not required (however, in this case, a user, etc. has to perform a setting operation with the margin taken into account).

[0068] Then, the computer 11 requests a target computer to perform a power-down process via the network, and notifies the target computer of the next power-up time (if the computer 11 adds a margin, then the value contains the margin)(for example, in the parameter form).

[0069] After the time interval defined according to the power-down interval 52c (step S16), the processes in steps S14 through S16 are performed if another target computer exists.

[0070] The processes in steps S14 through S16 are explained below by referring to the example shown in FIG. 4A. As described above, the power-down process is performed by following the power-up process steps in reverse. Therefore, the computer 41 is processed first. Since the power-up time of the computer 41 is 6:05, if a margin(10 minutes) is added in step S14, the power-up time notified for the computer 41 in step S15 is 6:15, which is given to the computer 41 that is requested to perform the power-down process. Then, after one minute, the process is started on the computer 31.

[0071] When the processes on all target computers are completed (NO in step S13), the computer 11 notifies its supply control device 12 of the power-up time, and instructs it to perform the power-down process (step S17), thereby performing the shutdown process (step S18).

[0072] The supply control device 12 stores the received next power-up time in an internal memory (not shown) (step S19). Then, after a period (several minutes) predetermined such that the power cannot be turned off before the shutdown is completed (step S20), the computer 11 is turned off (step S21).

[0073] Alternatively, upon receipt of the next power-up time notification and the power-down instruction in step S15 (step S32), each of the computers 21, 31, and 41 performs the process of allowing a margin at (adding a few minutes to) a received next power-up time. If this is done, there is no need for the representative computer to perform the process in step S14 (step S33).

[0074] Then, the next power-up time assigned a margin in step S14 or S33 is given to the power supply controller (the supply control device 22 in the example shown in FIG. 7) of the computer, and the power-down instruction is issued (step S34). Then, the shutdown process is performed (step S35).

[0075] The supply control device 22 stores the received next power-up time in the memory, etc. (step S36). Then, after a predetermined period (several minutes) to ensure that the power is not lost before the shutdown is completed (step S37), the power-down process is performed on the computer 21 (step S38). Similar processes are performed by the other supply control devices 32 and 42.

[0076] When the processes are performed according to the defined example shown in FIG. 4A, the power is sequentially turned off in order from the computer 41, then 31, 21 and finally to the computer 11.

[0077] The process associated with the power-up process performed when the next power-up date and time comes after the above mentioned power-down process is performed, and the power is turned off for each of the computers 11 through 41, is described below by referring to FIGS. 8 and 9. FIG. 8 is a flowchart for explanation of the power-up process in the normal operation. FIG. 9 is a flowchart for explanation of the power-up process in an abnormal condition (fault in representative computer 11).

[0078] First, the power-up process in the normal operation is described by referring to FIG. 8.

[0079] First, the supply control device 12 of the representative computer 11 starts turning on the computer 11 at the entered power-up date and time (step S41).

[0080] Once the computer 11 is activated (step S42), the power supply schedule management/control unit 11a reads the supply control target computer definition file 54, for example, shown in FIG. 4B (step S43), and sequentially issues a power-up instruction to the supply control devices for each of the supply control target computers defined in the definition file 54 (step S45). If the startup interval is set, the process on the next supply control target computer is started after the startup interval (step S46). If there is no more power-up target (NO in step S44), then the process terminates. The destination of the instruction in step S45 can be obtained by referring to the IP address of the supply control device of the supply control target computer definition file 54.

[0081] Upon receipt of the power-up instruction by step S45, each of the supply control target computers of the supply control devices 22, 32, and 42 starts turning on its own computer (step S47). Thus, each of the computers 21, 31, and 41 is activated (possibly at the startup interval) (step S48).

[0082] Next, the power-up process performed when an abnormal condition occurs is described below by referring to FIG. 9.

[0083] When the entered power-up date and time comes, the supply control device 12 of the representative computer 11 first starts turning on the computer 11 (step S41).

[0084] Assume that the computer 11 cannot be activated for some reason although the computer 21 etc. can be normally activated. In this case, it is obvious that the processes in steps S43 through S46 are not performed (as indicated by the big x mark shown in FIG. 9).

Therefore, time passes without any power-up instruction to each of the supply control devices 22, 32, and 42. Then, if each of the supply control devices 22, 32, and 42 determines that the power-up date and time entered in step S36 has come, then its own computer is turned on (step S49). Thus, each of the computers 21, 31, and 41 can be activated even though the computer 11 is in an abnormal condition and the activation is realized a little after the original power-up time (delayed by the margin added in step S14 or S33) (step S48).

[0085] FIG. 10 is a general view of the above mentioned process flow of the case in which the definition shown in FIG. 4A is set.

[0086] In FIG. 10, the definition of the schedule in the computer 11 is shown in FIG. 4A as described above. The supply control device 12 powers up the computer 11 at the power-up date and time (6:00) notified and entered during power-down. Thus, the computer 11 activates the OS, and requests the supply control device 22 to perform the power-up process based on the definition shown in FIG. 4A. At this request, the supply control device 22 powers up the computer 21.

[0087] After the defined startup interval = 3 minutes, the computer 11 requests the supply control device 32 to perform the power-up process. Furthermore, after another startup interval = 2 minutes, it requests the supply control device 42 to perform the power-up process. Upon these requests, the supply control devices 32 and 42 power up the computers 31 and 41 respectively.

[0088] After the activation, the computers 11 through 41 perform their respective processes. When the 'wait event for shutdown' is completed, they notify the computer 11 of the completion. In the example shown in FIG. 10, the computer 21 notifies the computer 11 of the end of (completion of processing of) the database.

[0089] The computer 11 starts the power-down process when the next power-down date and time comes and all computers notify the computer 11 that the 'wait event for shutdown' has been completed.

[0090] In this case, the process of assigning a margin is performed by each of the computers 21, 31, and 41 (that is, the process in step S14 shown in FIG. 7 is not performed, but the process in step S33 is performed).

[0091] According to the definition shown in FIG. 4A, the computer 11 first requests the computer 41 to perform the power-down process, and notifies the computer 41 of the next power-up date and time (6:05). The computer 41 notifies the supply control device 42 of the next power-up date and time (6:15) obtained by adding a predetermined margin (10 minutes) to the power-up date and time (6:05), and simultaneously instructs it to perform the power-down process. After the defined startup interval = 1 minute, the computer 11 requests the computers 31 and 21 to perform the power-down process. The next power-up date and time given then is 6:03 for the computer 31, and 6:00 for the computer 21.

[0092] The computer 31 notifies the supply control device 32 of the next power-up date and time (6:13) obtained by adding a predetermined margin (10 minutes) to the power-up date and time (6:03), and simultaneously instructs it to perform the power-down process.

[0093] The computer 21 notifies the supply control device 22 of the next power-up date and time (6:10) obtained by adding a predetermined margin (10 minutes) to the power-up date and time (6:00), and simultaneously instructs it to perform the power-down process.

[0094] Normally, the supply control device 22 activates the computer 21 at a request from the computer 11 sometime after the computer 11 is powered up at 6:00 (after a period required for the startup process of the computer 11). If 6:10 comes without receipt of any request, the computer 21 is activated.

[0095] FIG. 11 is a flowchart for explanation of another example of the power-down process in the system shown in FIG. 3.

[0096] In FIG. 11, the processes similar to those shown in FIG. 7 are assigned the same step numbers. The processes in steps S31 and S11 shown in FIG. 7 are omitted in FIG. 11, but are also performed in FIG. 11. As in the above mentioned processes, the computer whose power supply schedule is to be controlled is the computer 21 and the supply control device 22 for example.

[0097] In FIG. 11, the explanation of steps S12 and S13 are omitted.

[0098] If there is a target of power-down (YES in step S13), the next power-up time obtained in step S12 for the target computer 21 is assigned a small margin (10 minutes in this example) (step S51). This process is the same as the process in step S14, but is not assigned the same step numbers because, in this example, the process in step S33 is omitted.

[0099] Next, the supply control device 22 of the target computer 21 is notified of, and sets, the next power-up date and time obtained by adding the margin in step S51 (step S52).

[0100] Then, a power-down instruction is issued to the target computer 21 (step S53). Upon receipt of the power-down instruction (step S55), the computer 21 instructs the supply control device 22 to perform the power-down process (step S56), and performs shutdown (step S35).

[0101] On the other hand, upon receipt of the notification in step S52, the supply control device 22 enters the next power-up date and time, and enters the standby state. Then, upon receipt of the power-down instruction in step S56, and after a time (several minutes) predetermined such that the power-down process cannot be performed before the completion of shutdown (step S37), the supply control device 22 powers down the computer 21 (step S38).

[0102] Thus, in the present embodiment, the representative computer 11 instructs the supply control device of a control target computer to set the next power-up date and time. Thus, the function of the power supply management units 21a, 31a, and 41a of the computers

21, 31, and 41 respectively can be the function of only performing the shutdown process after instructing its own supply control device to perform the power-down process, thereby simplifying the function of the power supply schedule in the computers other than the representative computer.

[0103] FIG. 12 shows an example of the hardware configuration of a computer.

[0104] A computer 80 shown in FIG. 12 comprises a CPU 81, memory 82, an input device 83, a display device 84, a storage device 85, a medium drive device 86, a network connection device 87, etc. These components are interconnected through a bus 88. The configuration shown in FIG. 12 is an example, and the present invention is not limited to this configuration.

[0105] The CPU 81 is a central processing unit for controlling the entire computer 80.

[0106] The memory 82 can be RAM, etc. for temporarily storing a program or data stored in the storage device 85 (or a portable storage medium 89) when the program is executed and data is updated, etc. The CPU 81 performs the above mentioned processes using the program/data read to the memory 82.

[0107] The input device 83 can be, for example, a keyboard, a mouse, etc., and has the configuration with which the user can input data on the setting screen, etc. as shown in FIGS. 5 and 6.

[0108] The display device 84 can be, for example, a display, etc., and displays the setting screen, etc. as shown in FIGS. 5 and 6.

[0109] The storage device 85 can be, for example, a magnetic disk device, an optical disk device, a magneto-optic disk device, etc. and stores a program, data, etc. for realizing the supply control method for the above mentioned plurality of information processing devices.

[0110] The medium drive device 86 reads the program/data, etc. stored in the portable storage medium 89. The portable storage medium 89 can be, for example, an FD (floppy disk), CD-ROM, a DVD, a magneto-optical disk, etc.

[0111] The network connection device 87 is connected to a network, and has the configuration for transmission/reception (notification, etc. of the above mentioned power-up date and time) of data to and from other computers. Furthermore, data can be transmitted/received to and from external information processing devices through an external network(internet, etc.).

[0112] FIG. 13 shows an example of a storage medium.

[0113] As shown in FIG. 13, the above mentioned program/data stored in the portable storage medium 89 can be loaded into the information processing device, stored in the memory 82, and is executed. The above mentioned program/data can be ones stored in and downloaded from a storage device 92 of a device 91 of an external information provider.

[0114] In addition, the present invention can be configured as the above mentioned program itself. The present invention also can be configured as a transmission signal of the above mentioned program/data, etc. for transmission through a network.

[0115] As described above in detail, according to the supply control method for a plurality of information processing devices and the computer system using the method, and with the configuration in which a representative computer collectively manages/controls the automatic power ON/OFF schedule of the plurality of computers, computers can be successfully activated even if a representative computer is in an abnormal condition. Furthermore, even if the clock is fast or slow, the other computers can be powered up/down in a specified order.

[0116] In addition, the power-down process can be performed when it is time to perform the power-down process on all computers, and an occurrence in which the power-down process is performed during the operation can be avoided. If the startup/power-down times of each computer are related to one another, the basic startup/power-down times can be set, and the startup interval/power-down interval can be set. That is, it is not necessary to set or amend the startup/power-down times of each computer in the setting or amending process.

[0117] Thus, according to the present invention, there is provided a computer network, a representative computer requests performing a power-down process to the other computers and notifies the other computers of a next power-up date and time whenever a power-down date and time arrives. Each computer has a power supply control device which stores the power-up date and time. Each time a power-up date and time comes, the representative computer is powered up and activated by its own power supply control device and normally instructs each power supply control device of the other computers. However, if the representative computer cannot be activated for any reason, each power supply control device powers up its own computer at the stored power-up date and time.

Claims

1. A power supply control method in a system in which a power supply control device is provided for each of a plurality of information processing devices connected to a network, comprising:

    an arbitrary information processing device (11) of the plurality of information processing devices (11-41) issuing, according to a predetermined power-up/down schedule of said arbitrary information processing device (11) and the other information processing devices (21-41), a power-up instruction to each power supply control device (22-42) of the other information processing devices (21-41) upon each

activation;
instructing each of the information processing devices (21-41) to perform a power-down process, notifying the information processing devices of a next power-up date and time, and having each power supply control device (22-42) enter a next power-up date and time each time a power-down date and time comes; and
each power supply control device (22-42) of said other information processing devices (21-41) performing a power-up process upon receipt of the power-up instruction or when the entered power-up date and time comes.

2. A power supply control method in a system in which a power supply control device is provided for each of a plurality of information processing devices connected to a network, comprising:

    an arbitrary information processing device (11) of the plurality of information processing devices (11-41) issuing, according to a predetermined power-up/down schedule of said arbitrary information processing device (11) and the other information processing devices (21-41), a power-up instruction to each power supply control device (22-42) of the other information processing devices (21-41) upon each activation;
    notifying each power supply control device (22-42) of the other information processing devices (21-41) of a next power-up date and time, having each power supply control device (22-42) enter the next power-up date and time, and issuing a power-down instruction to each of the other information processing devices (21-41) each time a power-down date and time comes; and
    each power supply control device (22-42) of said other information processing devices (21-41) performing a power-up process upon receipt of the power-up instruction or when the entered power-up date and time comes.

3. The power supply control method according to claim 1 or 2, wherein
said power-up date and time given to each of said power supply control devices (22-42) of said other information processing devices (21-41) is obtained by said arbitrary information processing device (11) or each of said other information processing devices (21-41) adding an arbitrary margin to a power-up date and time in said predetermined power-up/down schedule.

4. The power supply control method according to claim 1, 2, or 3, wherein when the power-down date and time comes, said arbitrary information processing device (11) delays giving the power-down instruction and the next power-up date and time until a power-down permission condition entered in advance of a current and other information processing devices (21-41) is satisfied.

5. The power supply control method according to claim 1, 2, 3, or 4, wherein
said power-up instruction or power-down instruction is sequentially issued at predetermined startup intervals or power-down intervals.

6. An information processing apparatus (11) which is one of a plurality of information processing devices (11-41) in a computer system, each of the plurality of information processing devices having a power supply control device and connected to a network, said apparatus comprising:

    a power-up/down schedule storage means (50) for storing predetermined power-up/down schedules of said plurality of information processing devices (11-41);
    a power-up instruction means (11a) for instructing each power supply control device of the other information processing devices (21-41) to perform a power-up process at each activation process; and
    a power-down instruction means (11a) for instructing each power supply control device (22-42) to perform a power-down process and notifying each power supply control device (22-42) of a next power-up date and time whenever a power-down date and time comes according to said predetermined power-up/down schedule.

7. The information processing apparatus according to claim 6, wherein
said next power-up date and time given to each power supply control device (22-42) is obtained by any of said information processing devices or each of said information processing devices adding an arbitrary margin to a power-up date and time in a power-up/down schedule stored in said power-up/down schedule storage means (50) .

8. The information processing apparatus according to claim 6 or 7, further comprising:

    a power-down permission condition storage means (50) for storing a power-down permission condition of said apparatus (11) and the other information processing devices (21-41);
    wherein said apparatus does not give the power-down instruction and the next power-up date and time until said power-down permission condition is satisfied even when the power-

down date and time comes.

9. The information processing apparatus according to claim 6, 7, or 8, wherein

   said power-up instruction or power-down instruction is sequentially issued at predetermined startup intervals or power-down intervals.

10. A power supply control device in an information processing device connected to a network, comprising:

    a power-down means for storing a next power-up date and time when the next power-up date and time is received via the network together with a power-down instruction, and performing a power-down process on said information processing device; and
    a power-up means for performing a power-up process on said information processing device when a power-up instruction is received via the network or when said stored power-up date and time comes.

11. A program used to direct a computer to perform power supply control of a plurality of devices in a network, each of the devices being equipped with a power supply controller, by realizing the functions of:

    instructing each power supply controller to perform a power-up process at each activation process; and
    instructing each power supply controller to perform a power-down process and notifying each power supply controller of a next power-up date and time whenever a power-down date and time comes, according to a predetermined power-up/down schedule.

12. A computer-readable storage medium storing the program of claim 11.

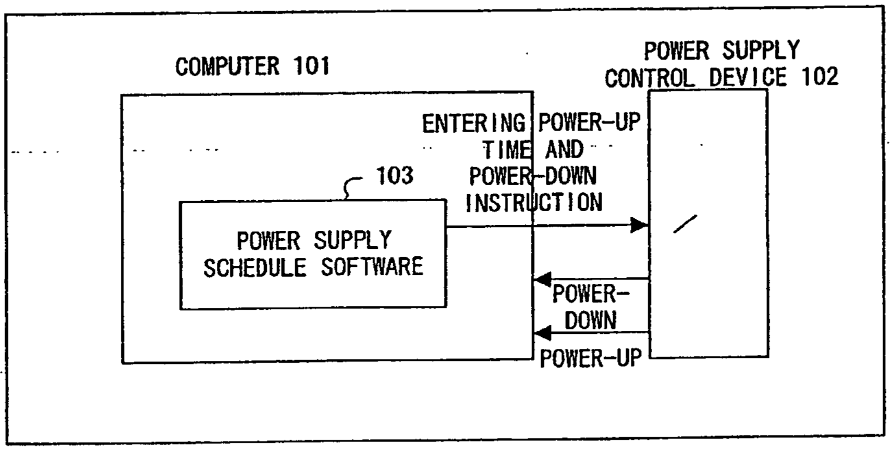
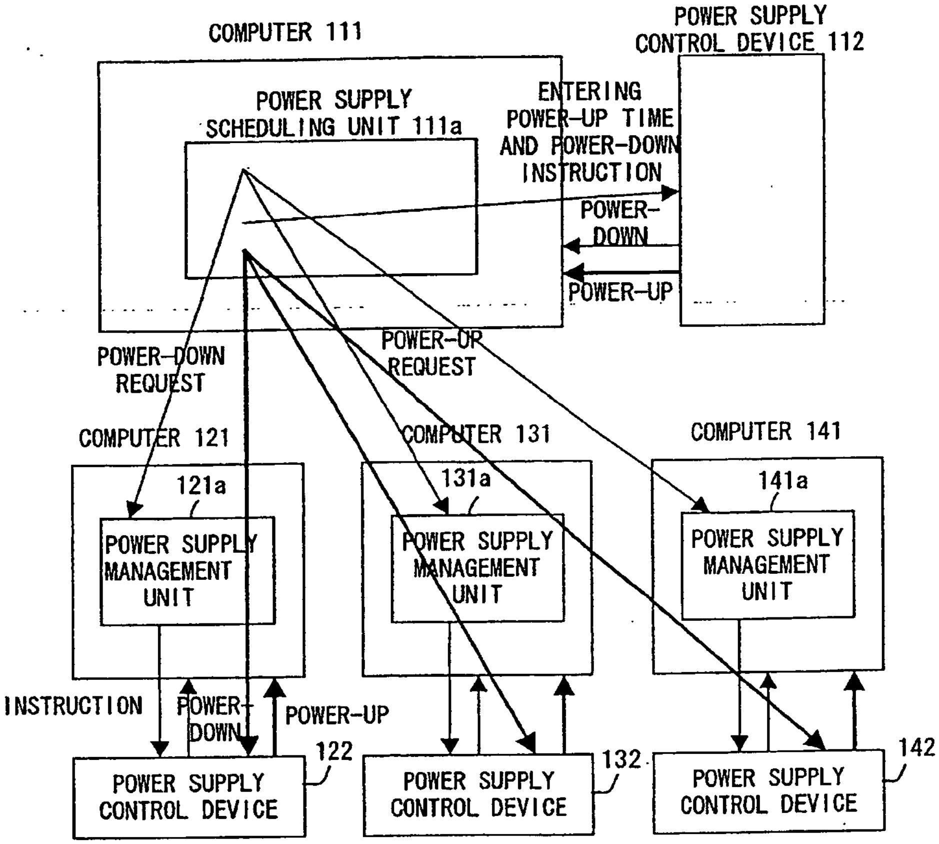
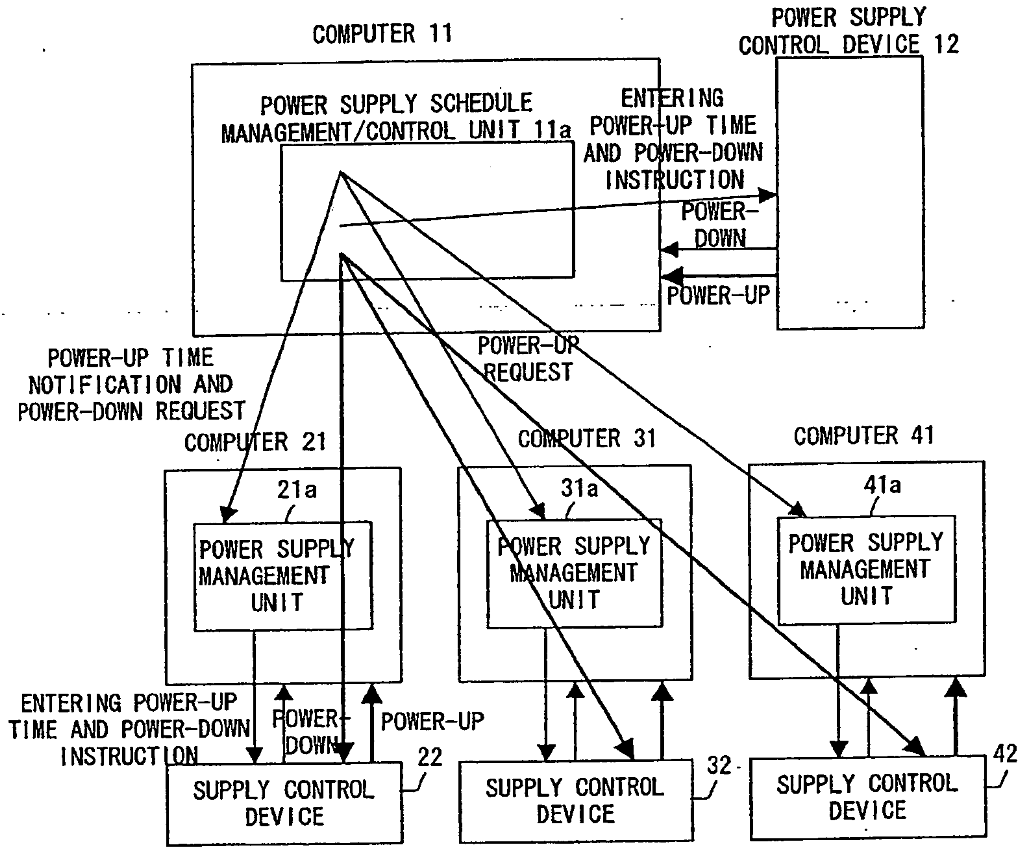

COMPUTER 101
POWER SUPPLY CONTROL DEVICE 102
103
POWER SUPPLY SCHEDULE SOFTWARE
ENTERING POWER-UP TIME AND POWER-DOWN INSTRUCTION
POWER-DOWN
POWER-UP

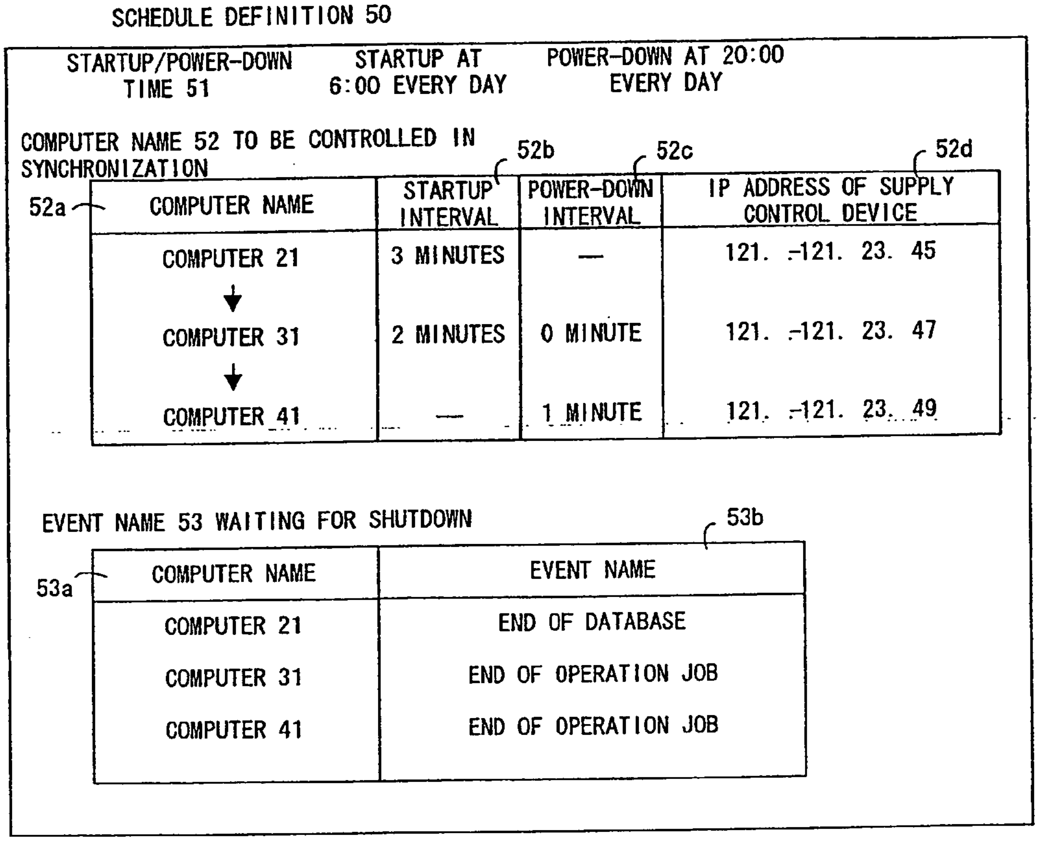
FIG. 1


COMPUTER 111
POWER SUPPLY CONTROL DEVICE 112
POWER SUPPLY SCHEDULING UNIT 111a
ENTERING POWER-UP TIME AND POWER-DOWN INSTRUCTION
POWER-DOWN
POWER-UP
POWER-DOWN REQUEST
POWER-UP REQUEST
COMPUTER 121
COMPUTER 131
COMPUTER 141
121a
131a
141a
POWER SUPPLY MANAGEMENT UNIT
POWER SUPPLY MANAGEMENT UNIT
POWER SUPPLY MANAGEMENT UNIT
INSTRUCTION
POWER-DOWN
POWER-UP
122
132
142
POWER SUPPLY CONTROL DEVICE
POWER SUPPLY CONTROL DEVICE
POWER SUPPLY CONTROL DEVICE

F I G. 2


COMPUTER 11
POWER SUPPLY CONTROL DEVICE 12
POWER SUPPLY SCHEDULE MANAGEMENT/CONTROL UNIT 11a
ENTERING POWER-UP TIME AND POWER-DOWN INSTRUCTION
POWER-DOWN
POWER-UP
POWER-UP TIME NOTIFICATION AND POWER-DOWN REQUEST
POWER-UP REQUEST
COMPUTER 21
COMPUTER 31
COMPUTER 41
21a
31a
41a
POWER SUPPLY MANAGEMENT UNIT
POWER SUPPLY MANAGEMENT UNIT
POWER SUPPLY MANAGEMENT UNIT
ENTERING POWER-UP TIME AND POWER-DOWN INSTRUCTION
POWER-DOWN
POWER-UP
22
32
42
SUPPLY CONTROL DEVICE
SUPPLY CONTROL DEVICE
SUPPLY CONTROL DEVICE

F I G. 3


52a
52b
52c
52d
53a
53b

SCHEDULE DEFINITION 50

STARTUP/POWER-DOWN TIME 51	STARTUP AT 6:00 EVERY DAY	POWER-DOWN AT 20:00 EVERY DAY

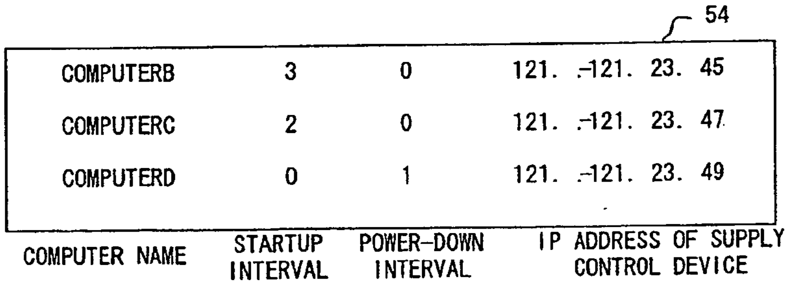
COMPUTER NAME 52 TO BE CONTROLLED IN SYNCHRONIZATION

COMPUTER NAME	STARTUP INTERVAL	POWER-DOWN INTERVAL	IP ADDRESS OF SUPPLY CONTROL DEVICE
COMPUTER 21	3 MINUTES	—	121. -121. 23. 45
↓			
COMPUTER 31	2 MINUTES	0 MINUTE	121. -121. 23. 47
↓			
COMPUTER 41	—	1 MINUTE	121. -121. 23. 49

EVENT NAME 53 WAITING FOR SHUTDOWN

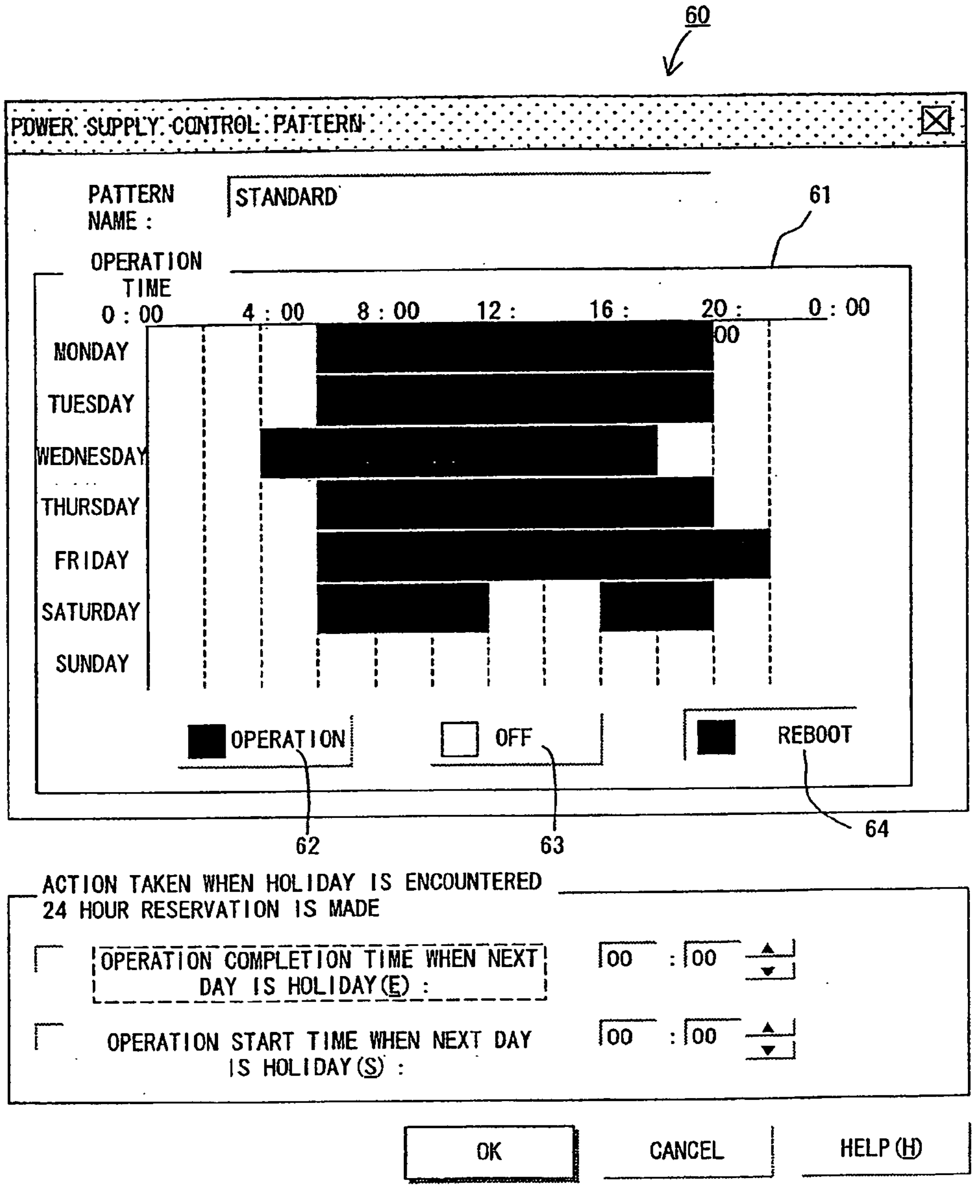
COMPUTER NAME	EVENT NAME
COMPUTER 21	END OF DATABASE
COMPUTER 31	END OF OPERATION JOB
COMPUTER 41	END OF OPERATION JOB

F I G. 4 A



COMPUTER NAME	STARTUP INTERVAL	POWER-DOWN INTERVAL	IP ADDRESS OF SUPPLY CONTROL DEVICE
COMPUTERB	3	0	121. -121. 23. 45
COMPUTERC	2	0	121. -121. 23. 47
COMPUTERD	0	1	121. -121. 23. 49

F I G. 4 B



POWER SUPPLY CONTROL PATTERN

PATTERN NAME : STANDARD

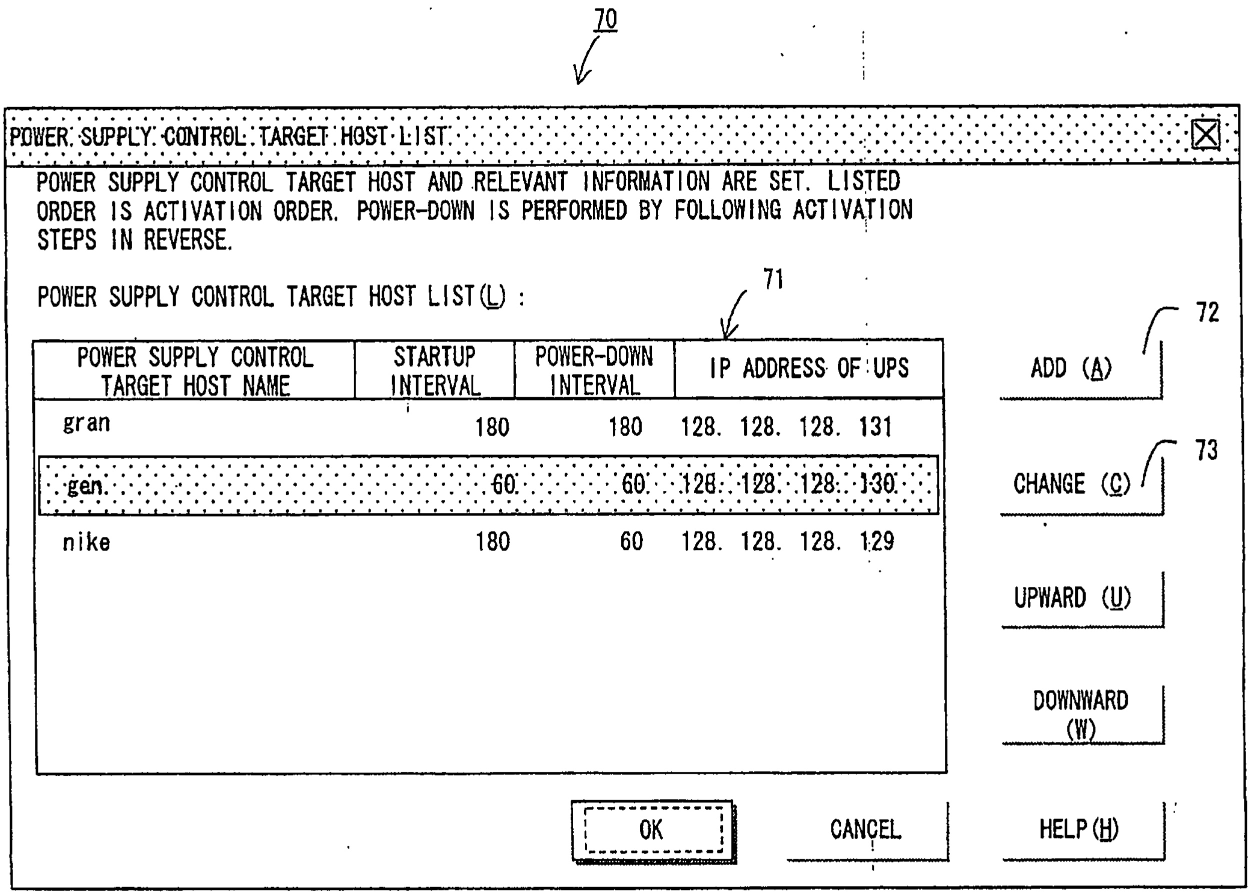
ACTION TAKEN WHEN HOLIDAY IS ENCOUNTERED 24 HOUR RESERVATION IS MADE

☐ OPERATION COMPLETION TIME WHEN NEXT DAY IS HOLIDAY(E) : 00 : 00

☐ OPERATION START TIME WHEN NEXT DAY IS HOLIDAY(S) : 00 : 00

FIG. 5

BEST AVAILABLE COPY

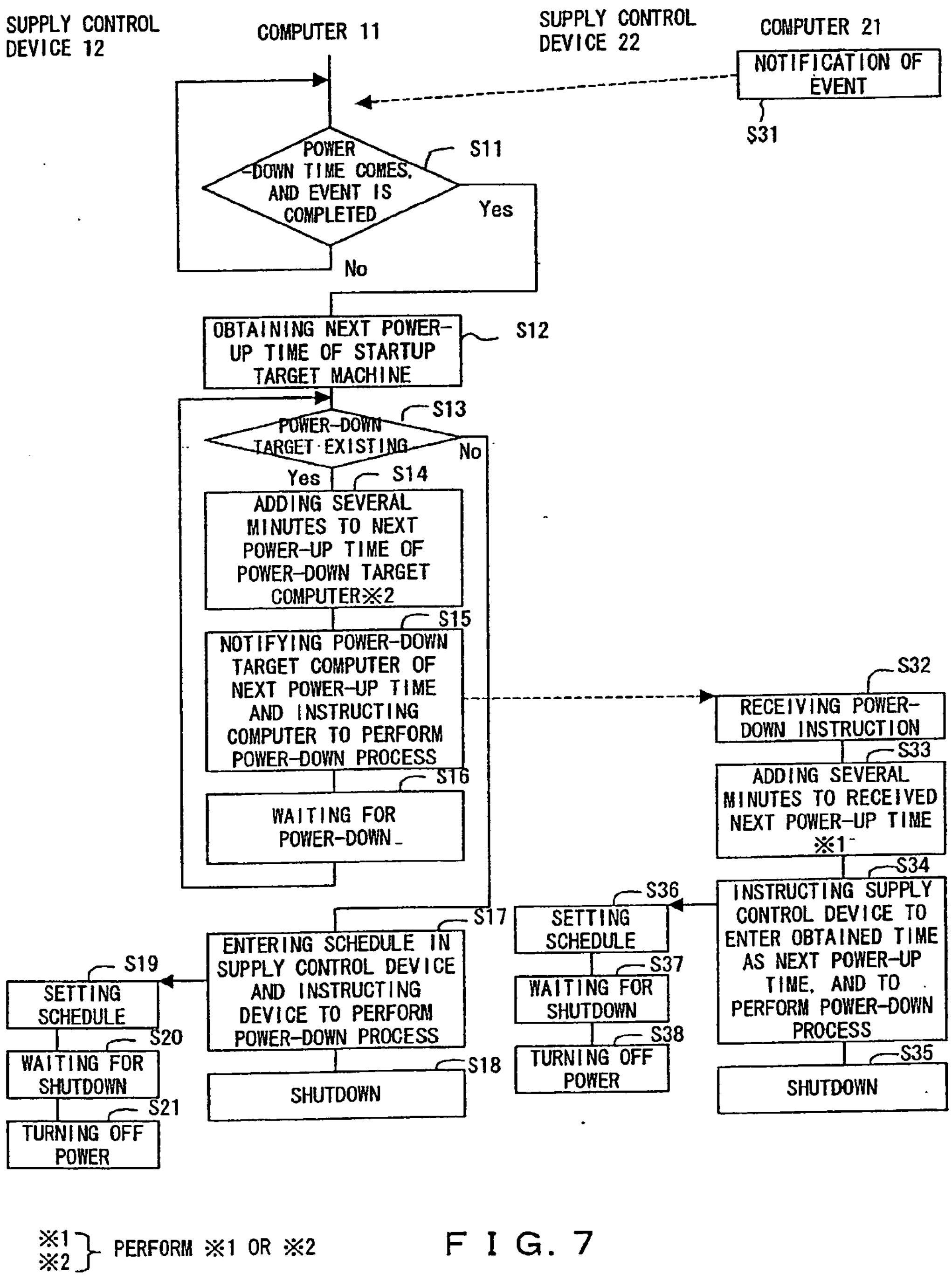

POWER SUPPLY CONTROL TARGET HOST LIST

POWER SUPPLY CONTROL TARGET HOST AND RELEVANT INFORMATION ARE SET. LISTED ORDER IS ACTIVATION ORDER. POWER-DOWN IS PERFORMED BY FOLLOWING ACTIVATION STEPS IN REVERSE.

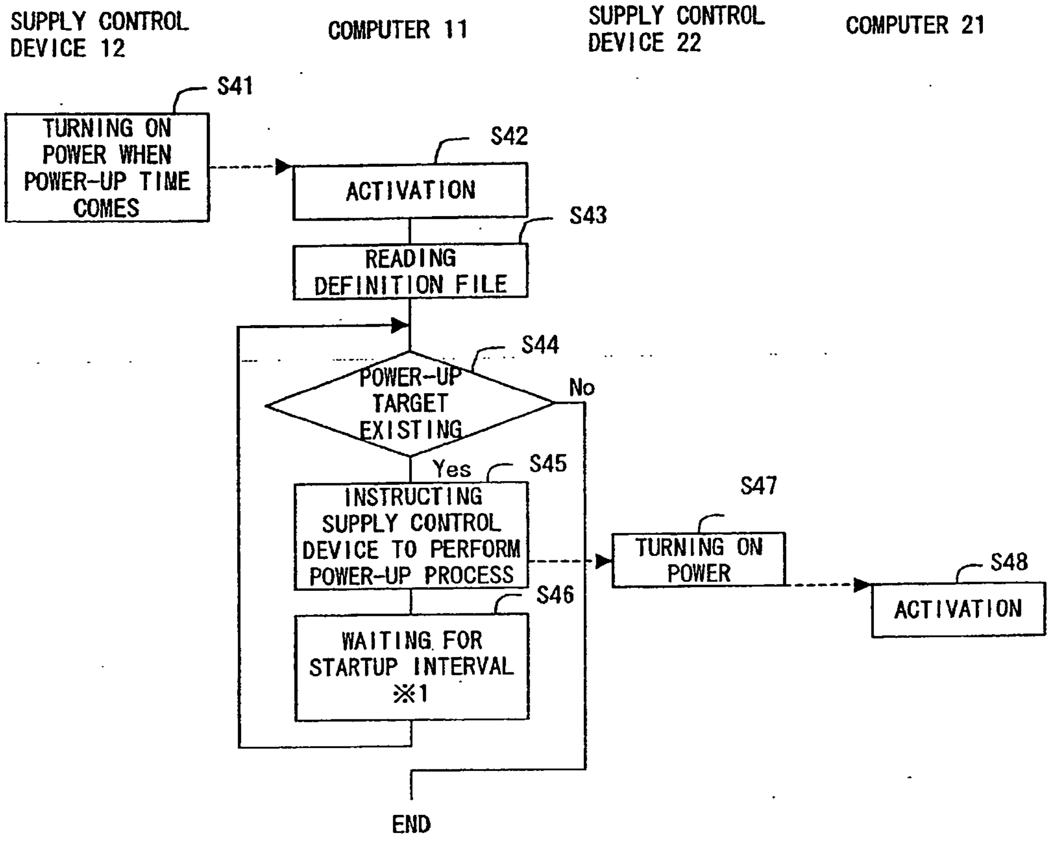
POWER SUPPLY CONTROL TARGET HOST LIST(L) :

POWER SUPPLY CONTROL TARGET HOST NAME	STARTUP INTERVAL	POWER-DOWN INTERVAL	IP ADDRESS OF UPS
gran	180	180	128. 128. 128. 131
gen	60	60	128. 128. 128. 130
nike	180	60	128. 128. 128. 129

F I G. 6

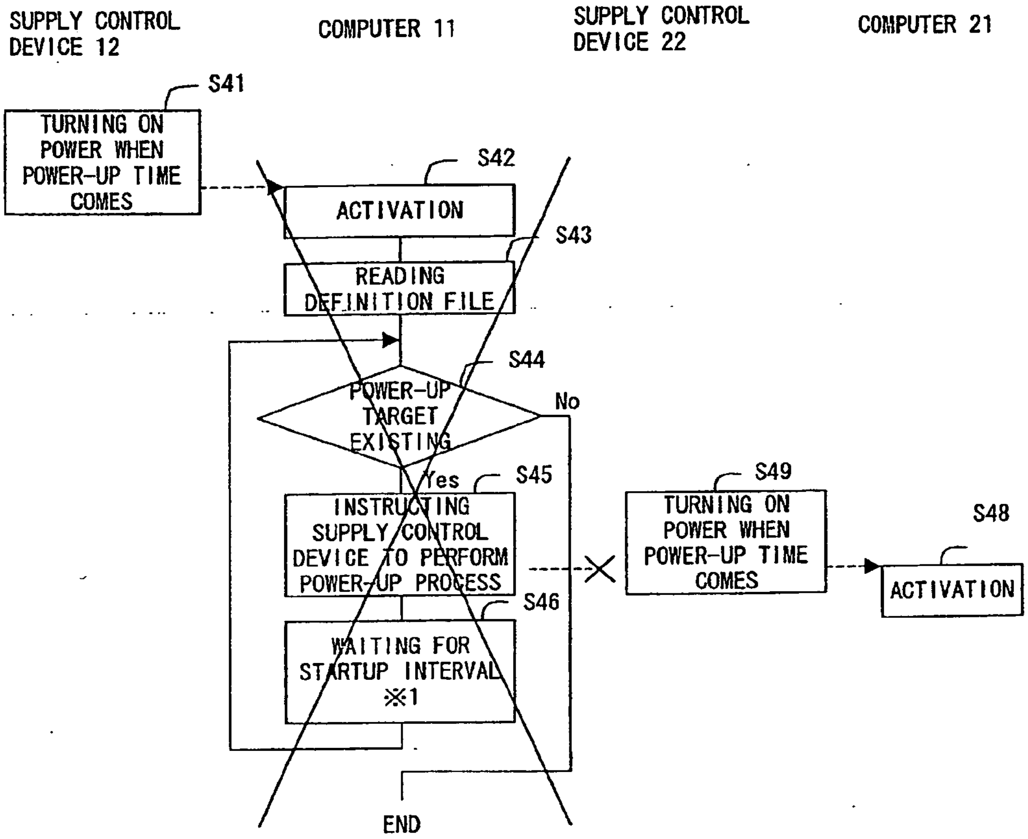

SUPPLY CONTROL DEVICE 12
COMPUTER 11
SUPPLY CONTROL DEVICE 22
COMPUTER 21
NOTIFICATION OF EVENT
S31
POWER-DOWN TIME COMES, AND EVENT IS COMPLETED
S11
Yes
No
OBTAINING NEXT POWER-UP TIME OF STARTUP TARGET MACHINE
S12
POWER-DOWN TARGET EXISTING
S13
No
Yes
S14
ADDING SEVERAL MINUTES TO NEXT POWER-UP TIME OF POWER-DOWN TARGET COMPUTER※2
S15
NOTIFYING POWER-DOWN TARGET COMPUTER OF NEXT POWER-UP TIME AND INSTRUCTING COMPUTER TO PERFORM POWER-DOWN PROCESS
S16
WAITING FOR POWER-DOWN
S32
RECEIVING POWER-DOWN INSTRUCTION
S33
ADDING SEVERAL MINUTES TO RECEIVED NEXT POWER-UP TIME ※1
S34
INSTRUCTING SUPPLY CONTROL DEVICE TO ENTER OBTAINED TIME AS NEXT POWER-UP TIME, AND TO PERFORM POWER-DOWN PROCESS
S35
SHUTDOWN
S36
SETTING SCHEDULE
S37
WAITING FOR SHUTDOWN
S38
TURNING OFF POWER
S17
ENTERING SCHEDULE IN SUPPLY CONTROL DEVICE AND INSTRUCTING DEVICE TO PERFORM POWER-DOWN PROCESS
S18
SHUTDOWN
S19
SETTING SCHEDULE
S20
WAITING FOR SHUTDOWN
S21
TURNING OFF POWER
※1
※2
PERFORM ※1 OR ※2

F I G. 7

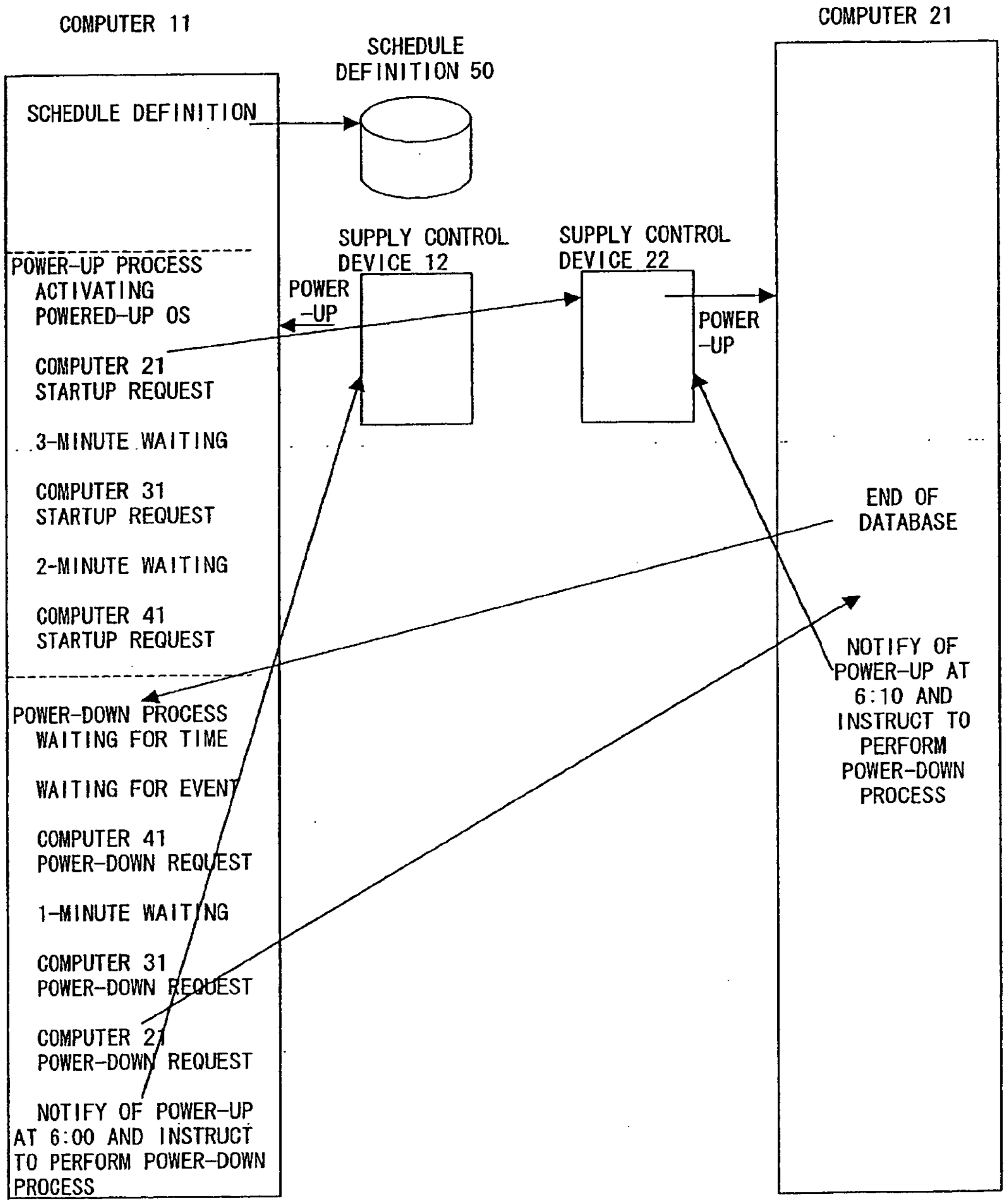


※1 : CAN BE OMITTED

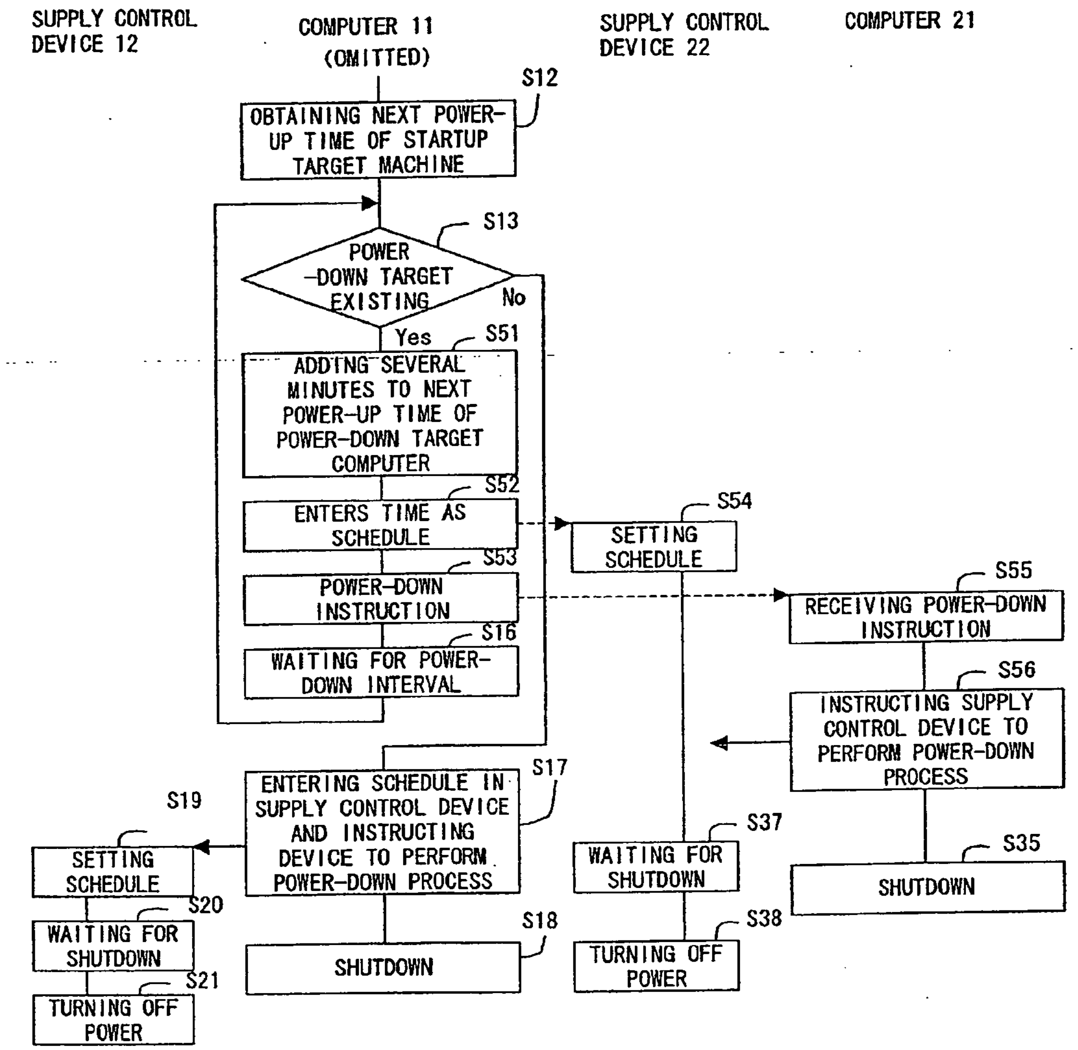
F I G. 8


SUPPLY CONTROL DEVICE 12
COMPUTER 11
SUPPLY CONTROL DEVICE 22
COMPUTER 21
S41
TURNING ON POWER WHEN POWER-UP TIME COMES
S42
ACTIVATION
S43
READING DEFINITION FILE
S44
POWER-UP TARGET EXISTING
No
Yes
S45
INSTRUCTING SUPPLY CONTROL DEVICE TO PERFORM POWER-UP PROCESS
S46
WAITING FOR STARTUP INTERVAL ※1
END
S49
TURNING ON POWER WHEN POWER-UP TIME COMES
S48
ACTIVATION

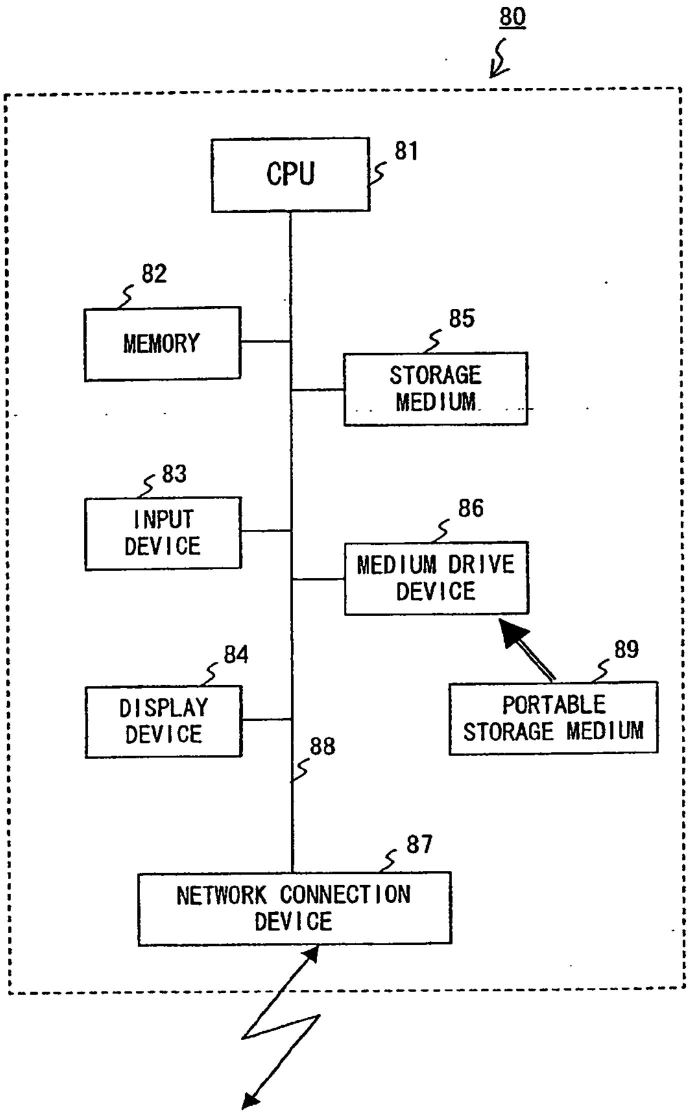
F I G. 9


COMPUTER 11
SCHEDULE DEFINITION
POWER-UP PROCESS
ACTIVATING POWERED-UP OS
COMPUTER 21 STARTUP REQUEST
3-MINUTE WAITING
COMPUTER 31 STARTUP REQUEST
2-MINUTE WAITING
COMPUTER 41 STARTUP REQUEST
POWER-DOWN PROCESS
WAITING FOR TIME
WAITING FOR EVENT
COMPUTER 41 POWER-DOWN REQUEST
1-MINUTE WAITING
COMPUTER 31 POWER-DOWN REQUEST
COMPUTER 21 POWER-DOWN REQUEST
NOTIFY OF POWER-UP AT 6:00 AND INSTRUCT TO PERFORM POWER-DOWN PROCESS
SCHEDULE DEFINITION 50
SUPPLY CONTROL DEVICE 12
POWER -UP
SUPPLY CONTROL DEVICE 22
POWER -UP
COMPUTER 21
END OF DATABASE
NOTIFY OF POWER-UP AT 6:10 AND INSTRUCT TO PERFORM POWER-DOWN PROCESS

F I G. 1 0


SUPPLY CONTROL DEVICE 12
COMPUTER 11 (OMITTED)
SUPPLY CONTROL DEVICE 22
COMPUTER 21
S12
OBTAINING NEXT POWER-UP TIME OF STARTUP TARGET MACHINE
S13
POWER -DOWN TARGET EXISTING
No
Yes
S51
ADDING SEVERAL MINUTES TO NEXT POWER-UP TIME OF POWER-DOWN TARGET COMPUTER
S52
ENTERS TIME AS SCHEDULE
S54
SETTING SCHEDULE
S53
POWER-DOWN INSTRUCTION
S55
RECEIVING POWER-DOWN INSTRUCTION
S16
WAITING FOR POWER-DOWN INTERVAL
S56
INSTRUCTING SUPPLY CONTROL DEVICE TO PERFORM POWER-DOWN PROCESS
S17
ENTERING SCHEDULE IN SUPPLY CONTROL DEVICE AND INSTRUCTING DEVICE TO PERFORM POWER-DOWN PROCESS
S19
SETTING SCHEDULE
S37
WAITING FOR SHUTDOWN
S35
SHUTDOWN
S20
WAITING FOR SHUTDOWN
S18
SHUTDOWN
S38
TURNING OFF POWER
S21
TURNING OFF POWER

F I G. 1 1


80
CPU
81
82
MEMORY
85
STORAGE MEDIUM
83
INPUT DEVICE
86
MEDIUM DRIVE DEVICE
84
DISPLAY DEVICE
89
PORTABLE STORAGE MEDIUM
88
87
NETWORK CONNECTION DEVICE

F I G. 1 2

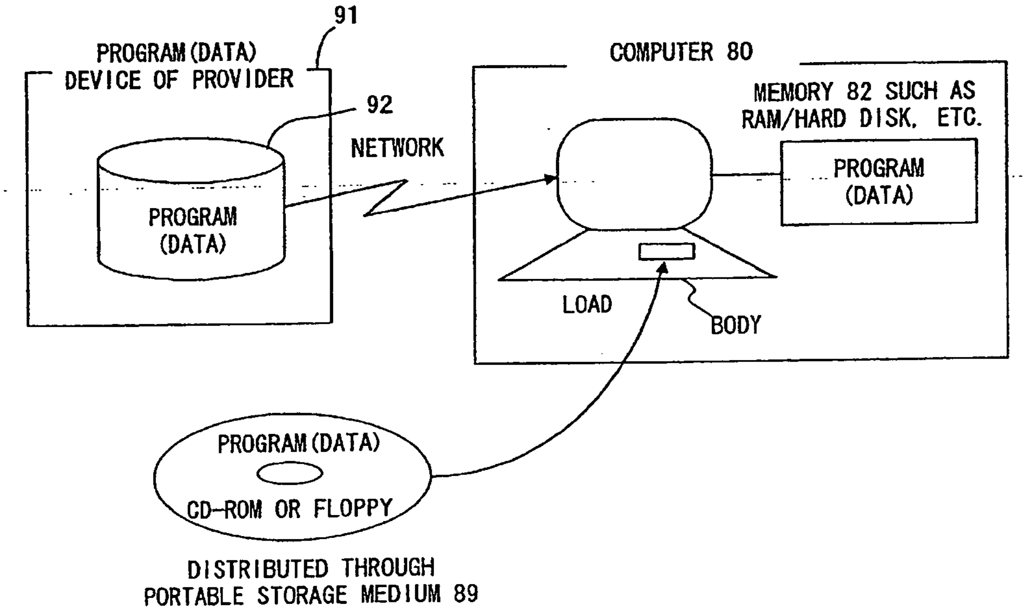

91
PROGRAM (DATA)
DEVICE OF PROVIDER
92
NETWORK
PROGRAM
(DATA)
COMPUTER 80
MEMORY 82 SUCH AS
RAM/HARD DISK, ETC.
PROGRAM
(DATA)
LOAD
BODY
PROGRAM (DATA)
CD-ROM OR FLOPPY
DISTRIBUTED THROUGH
PORTABLE STORAGE MEDIUM 89

FIG. 13

PATENT ABSTRACTS OF JAPAN

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(43)Date of publication of application : 10.05.2002

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G06F 1/26
G06F 3/06
G11B 19/00

(21)Application number : 2000-318019
(22)Date of filing : 18.10.2000

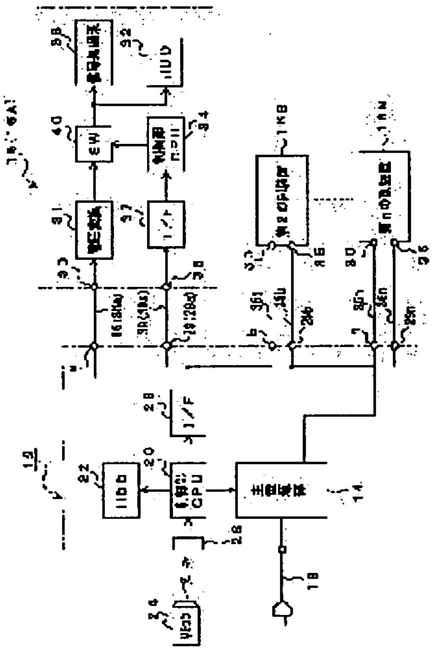
(71)Applicant : AIWA CO LTD
(72)Inventor : YOSHIDA TOMOHIKO
ITO KAZUNORI
WATANABE YOJI

(54) ELECTRONIC DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To supply power to plural accessory electronic devices by using a small power supply.

SOLUTION: This electronic device has a main power supply which can drive plural accessory devices at the same time, power supply terminals for those devices, a control means to supply power to the plural accessory devices through the power supply terminals, and an interface to communicate with the outside. To start the above plural accessory devices using the main power supply, an instruction is given to shift each start timing for those accessory devices through the interface. Receiving the start confirmation signals from the accessory devices, or after the time elapses longer than predetermined, the main power supply starts to supply power to the next accessory device. Thus, by shifting the power supply start timing, the main power supply can be used even if its capacity is small.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

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(19)日本国特許庁（ＪＰ）　　(12) **公開特許公報**（Ａ）

(11)特許出願公開番号
特開2002－135974
（P2002－135974A）

(43)公開日　平成14年５月10日(2002.5.10)

(51)Int.Cl.⁷	識別記号	ＦＩ	テーマコート゛(参考)
Ｈ０２Ｊ　1/00	３０９	Ｈ０２Ｊ　1/00　３０９Ｒ	５Ｂ０１１
Ｇ０６Ｆ　1/26		Ｇ０６Ｆ　3/06	５Ｂ０６５
3/06		Ｇ１１Ｂ　19/00　５０１Ｇ	５Ｇ０６５
Ｇ１１Ｂ　19/00	５０１	Ｇ０６Ｆ　1/00　３３４Ｄ	

審査請求　未請求　請求項の数４　ＯＬ　（全　７　頁）

(21)出願番号　特願2000－318019(P2000－318019)

(22)出願日　平成12年10月18日(2000.10.18)

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(72)発明者　伊藤　一記
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(74)代理人　100090376
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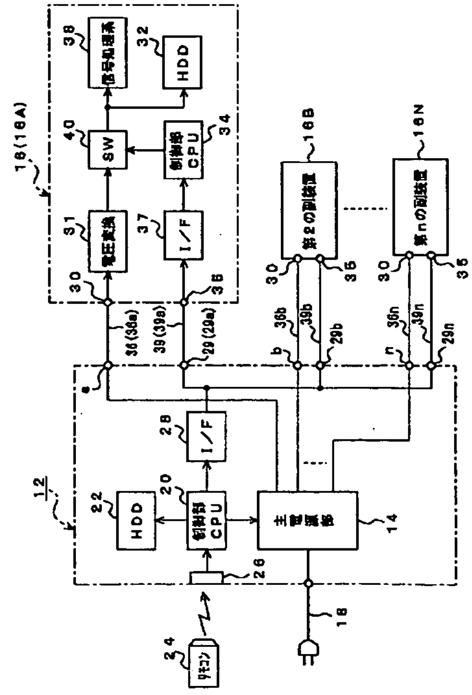
最終頁に続く

(54)【発明の名称】　電子機器

(57)【要約】
【課題】複数の副電子機器への電源供給を小型の電源部で実現する。
【解決手段】複数の副電子機器を同時に駆動できる主電源部と、これら複数の電子機器に対する電源供給端子と、これら電源供給端子を介して複数の副電子機器に対する電源供給を制御する制御部と、外部との通信を行うインタフェース部が設けられ、主電源部を用いて上記複数の副電子機器の動作を立ち上げるときには、インタフェース部を介して上記副電子機器に対する電源の立ち上げタイミングをずらす指令信号を発行する。副電子機器からの電源立ち上げ確認信号が供給されたとき、若しくは所定時間経過したとき、次の副電子機器に対する電源を立ち上げる。このように電源立ち上げのタイミングを順次ずらすことによって、主電源部の電源容量が小型のものでも実用になる。



【特許請求の範囲】

【請求項１】　複数の副電子機器を同時に駆動できる主電源部と、
これら複数の副電子機器に対する電源供給端子と、
これら電源供給端子を介して上記複数の副電子機器に対する電源供給を制御する制御部と、
外部との通信を行うインタフェース部が設けられ、
上記主電源部を用いて上記複数の副電子機器の動作を立ち上げるときには、上記インタフェース部を介して上記副電子機器に対する電源の立ち上げタイミングをずらす指令信号を発行するようにしたことを特徴とする電子機器。

【請求項２】　上記副電子機器からの電源立ち上げ確認信号が供給されたとき、若しくは所定時間経過したとき、次の副電子機器に対する電源を立ち上げるようにしたことを特徴とする請求項２記載の電子機器。

【請求項３】　ＤＣ電源に対する電圧変換部と、
そのＤＣ電源を制御する制御部と、
外部との通信を行うインタフェース部とが設けられ、
このインタフェース部を介して電源供給のための指令信号が入力したとき、内部回路系に上記ＤＣ電源を供給するようにしたことを特徴とする電子機器。

【請求項４】　上記内部回路系には、ハードディスク装置などの記録媒体が設けられ、この記録媒体に設けられた駆動モータへの電源供給が上記指令信号に基づいて制御されるようになされたことを特徴とする請求項３記載の電子機器。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】この発明は、複数の副電子機器を負荷として駆動できるようにした電子機器および主電源部を持たずに外部よりＤＣ電源の供給を受けるようにした電子機器に関する。詳しくは、接続された複数の副電子機器への電源供給タイミングを所定時間だけずらした状態で順次行うことによって、主電源部の電源容量を抑えることができるようにしたしたものである。

【０００２】

【従来の技術】ＡＣ電源から電源（電力）の供給を受ける電子機器、例えば記録媒体を内蔵した記録再生装置は内部にＡＣ－ＤＣ変換を行い、所定のＤＣ電圧を負荷に供給する電源部を有するが、このような電源部を持たない電子機器（以下副電子機器という）の開発も進められている。このような副電子機器にあっては、ＡＣアダプターのようにＤＣ電源装置から電源の供給を受けることになる。副電子機器も記録媒体を内蔵した記録再生装置などが考えられる。

【０００３】図４はハードディスク装置ＨＤＤを内蔵した記録再生装置を電子機器としたときの構成ブロック図を示すもので、主電源部１４を有する主記録再生装置（以下主電子機器という）１２と、この主電子機器１２からＤＣ電源供給を受ける副記録再生装置（以下副電子機器という）１６が電源ケーブル３６によって接続されている。副電子機器１６がｎ台接続されているときには、電源ケーブル３６もｎ本（３６ａ、３６ｂ、・・・３６ｎ）だけ主電子機器１２に接続される。

【０００４】主電子機器１２にはＡＣケーブル１８が設けられ、ＡＣ電源からの電源の供給を受けるようになっている。この主電子機器１２には主電源部１４の他に、ハードディスク装置２２に対する記録再生などの動作モードを制御すると共に、外部への電源供給状態を制御するＣＰＵで構成された制御部２０を有する。そのため、この主制御部２０によって主電源部１４が制御される。

【０００５】またこの主電子機器１２にはリモコン２４の受信部２６が設けられ、外部から主電子機器１２に対する制御および主電子機器１２を介して副電子機器１６に対する電源のオンオフ制御ができるようになされている。

【０００６】副電子機器１６は少なくとも１以上の装置１６Ａ、１６Ｂ、・・・１６Ｎで構成される。それぞれは同一構成であるので、その１つの装置例えば１６Ａについてのみその構成を説明する。

【０００７】副電子機器１６Ａには外部電源端子３０が設けられ、ここには主電子機器１２に接続されたＤＣ電源用の電源ケーブル３６ａが接続される。副電子機器１６Ａも記録再生装置である場合を示すので、その内部には、ハードディスク装置３２が内蔵されると共に、ハードディスク装置３２に対する記録再生制御などの動作モード制御などを司るＣＰＵで構成された制御部３４を有する。なお、必要に応じて電圧変換部３６を設けることもできる。この電圧変換部３１で値の異なる複数のＤＣ電圧を生成できる。

【０００８】複数若しくは特定の副電子機器１６に対する駆動は、動作中にある主電子機器１２からＤＣ電源が対応する電源ケーブル３６を介して行う。例えばリモコン２４を操作してまず主電源１２を立ち上げる。次にリモコン２４から制御部２０を制御して、複数の副電子機器１６に対してＤＣ電源を供給する。このＤＣ電源の供給によってそれぞれの副電子機器１６は駆動状態に至り、例えばハードディスク装置３２にはディスク駆動モータ（図示はしない）が設けられているので、この駆動モータが起動されて定常駆動モードへと遷移する。なお、主電子機器１２の制御部２０および副電子機器１６の制御部３４はそれぞれバックアップされているものとする。

【０００９】

【発明が解決しようとする課題】ところで、主電子機器１２からの電源を複数の副電子機器１６に供給する場合、この電源供給時（副電子機器１６の起動時）には、瞬時電圧の大きな突入電流が流れる。すなわち、電源投入時には副電子機器内の回路に設けられたコンデンサに

対して比較的大きな突入電流が流れると共に、ハードディスク装置３２などに設けられた駆動モータへの起動電流も流れる。突入電流は瞬時電流であって比較的大きな電流であり、また起動電流も瞬時電流で、動作電流の２倍程度の電流値（５００～６００ｍA程度）である。

【００１０】したがって主電子機器１２に対して副電子機器１６がN台接続されているようなときで、それらを同時に立ち上げるようなときには、N台の副電子機器１６が分け隔てなく同時に起動されるため、電源の立ち上げ時には大きなピーク電流が重なって流れる可能性が高い。そのような場合にそれぞれの副電子機器１６に対する供給電圧の電圧ダウンを避けるためには、N倍のピーク電力を供給できるように主電源部１４としては大きな電力の供給が可能な、電源容量の大きな電源部を装備しなくてはならない。

【００１１】これは主電子機器１２の小型化を阻害すると共に、定格の大きな電子部品を選択する必要になるので、装置のコストアップを招来することになってしまう。

【００１２】そこで、この発明はこのような従来の課題を解決したものであって、特に複数の電子機器を接続できるようになされており、それらに対してＤＣ電源を供給する場合には、電源の供給タイミングをずらして順次供給するように制御することで、小型の主電源部を使用できる電子機器を提案するものである。また、主電源部を持たずに外部よりＤＣ電源の供給を受けるようにした電子機器を提案するものである。

【００１３】

【課題を解決するための手段】上述の課題を解決するため、請求項１に記載したこの発明に係る電子機器では、複数の副電子機器を同時に駆動できる主電源部と、これら複数の副電子機器に対する電源供給端子と、これら電源供給端子を介して上記複数の副電子機器に対する電源供給を制御する制御部と、外部との通信を行うインタフェース部が設けられ、上記主電源部を用いて上記複数の副電子機器の動作を立ち上げるときには、上記インタフェース部を介して上記副電子機器に対する電源の立ち上げタイミングをずらす指令信号を発行するようにしたことを特徴とする。

【００１４】また、請求項３に記載したこの発明に係る電子機器では、ＤＣ電源に対する電圧変換部と、そのＤＣ電源を制御する制御部と、外部との通信を行うインタフェース部とが設けられ、このインタフェース部を介して電源供給のための指令信号が入力したとき、内部回路系に上記ＤＣ電源を供給するようにしたことを特徴とする。

【００１５】この発明では、１台の電子機器（主電子機器）から複数の副電子機器に電源を供給するように構成されているときで、主電子機器側では、外部との通信を行うインタフェース部が設けられ、主電源部を用いて複数の副電子機器の動作を立ち上げるときには、インタフェース部を介して副電子機器に対する電源の立ち上げタイミングをずらす指令信号を発行する。この場合、ＤＣ電源そのものはそれぞれの副電子機器に供給しておく。ただし、指令信号が入力しない限り、副電子機器は駆動状態には至らない。

【００１６】このようにそれぞれの副電子機器に設けられた制御部への起動命令の発行タイミングを順次ずらすことによって、複数台の副電子機器が接続されているときでも、複数台分のピーク電力を同時に供給する必要がなくなるので、主電源部の電源容量としてN台分の電源容量分を備える必要はない。

【００１７】副電子機器に対する制御部に起動命令が入力したときには、副電子機器の内部回路系に対して駆動電流を流し、そしてハードディスク装置の駆動モータに対して駆動電流を供給する。これによって始めてその副電子機器は駆動状態に移行する。副電子機器は主電源部を持たなくても済むので、それだけ小型化、コストダウンを図れる。

【００１８】

【発明の実施の形態】続いて、この発明に係る電子機器の一実施形態を図面を参照して詳細に説明する。図１はこの発明を適用した電子機器（主電子機器と副電子機器）の接続図を示すものである。主電子機器１２から説明すると、この主電子機器１２は従来と同様に、主電源部１４を有し、これはＡＣ電源コード１８を介して供給されるＡＣ電源から所定のＤＣ電圧を生成するためのものである。

【００１９】主電子機器１２に設けられたこの主電源部１４は自らのＤＣ電源として使用される他に、この主電子機器１２に接続される複数台の副電子機器１６に対するＤＣ電源部としても機能するような電源容量のものが使用される。これについてはさらに後述する。

【００２０】主電子機器１２内には記録媒体としてこの例ではハードディスク装置ＨＤＤ２２が設けられ、このハードディスク装置２２に対する記録再生などの動作モードなどはＣＰＵで構成された制御部２０によって制御される。制御部２０は主電源部１４のオンオフおよび副電子機器１６への電源供給なども制御する。

【００２１】主電子機器１２にはリモコン２４の受信部２６が設けられ、遠隔的に主電子機器１２を制御できる構成となされる。そのため、受信部２６でのリモコン制御信号は制御部２０に供給される。

【００２２】制御部２０には外部との通信を行うためのインタフェース部２８が設けられ、このインタフェース部２８を介して外部への指令信号の発信が行われ、また外部からの各種信号（電源の立ち上がり確認信号など）を受信して制御部２０に転送する処理が行われる。そのため、主電子機器１２にはインタフェース部２８に接続された複数の通信ケーブル用の端子２９（２９a、２９ ｂ、・・・２９ｎ）が設けられている。主電子機器１２にはさらに主電源部１４で変換されたＤＣ電源供給端子ａ、ｂ、・・・ｎが設けられている。通信用インタフェース部２８としてはＵＳＢやＩＥＥＥ１３９４用インタフェースなどが考えられる。

【００２３】一方、この主電子機器１２に対して接続される複数台の副電子機器１６は全て同一に構成されているので、副電子機器１６Ａについてその構成および動作を説明する。副電子機器１６Ａには外部電源端子３０の他に、外部との通信を行うための端子３５が設けられている。

【００２４】外部電源端子３０には上述した電源ケーブル３６ａが接続され、この電源ケーブル３６ａを介して主電子機器１２で生成されたＤＣ電源（駆動電圧）が供給される。外部電源端子３０には電圧変換部３１が接続され、ここで副電子機器１６内で使用する所定のＤＣ電圧に降圧される。降圧されたＤＣ電圧は副電子機器１６Ａを構成する信号処理系３８と、この例ではハードディスク装置ＨＤＤ３２にそれぞれ駆動電圧として供給される。

【００２５】信号処理系３８は記録再生系などであり、ハードディスク装置３２には磁気ディスクと、これを駆動する駆動モータおよび記録再生処理を行うためのインタフェース部（何れも図示はしない）がそれぞれ設けられており、これらに対しての駆動電圧としてＤＣ電圧が供給される。

【００２６】また、端子３５に入力した外部指令信号はインタフェース部３７を介してＣＰＵで構成された制御部３４に供給される。制御部３４をその入力信号に基づいて制御（記録再生制御など）することもできる。

【００２７】この発明ではこれらの構成に加え、さらに電源制御部４０が設けられる。電源制御部４０はスイッチング手段などで構成することができ、したがって制御部３４からの指令によってスイッチング状態が制御される。この実施の形態では、外部から電源立ち上げの指令信号が入力したとき始めて電圧変換部３１からのＤＣ電圧が信号処理系３８と、ハードディスク装置３２にその駆動電圧として供給されるようになっている。

【００２８】このように外部からＤＣ電源の供給を受けるように構成することで、副電子機器１６自体にはスイッチングレギュレータなどのＡＣ－ＤＣコンバータなどが不要になるから、副電子機器にあっても一層の小型化およびコストダウンを図れる実益を有する。

【００２９】さて、複数の副電子機器１６に対する電源の立ち上げ処理を図２を参照して説明する。まず、同図Ａのようにリモコン２４などから主電子機器１２に対する電源の立ち上げ指令を行う。主電子機器１２の動作が正常に立ち上がると、主電源部１４から複数の副電子機器１６に対して所定のＤＣ電源が印加される。このように所定のＤＣ電源が印加された状態になってから、制御部２０では副電子機器１６に対する電源の立ち上げ指定を行う。

【００３０】例えば第１の副電子機器１６Ａに対して通信ケーブル３９ａを介して電源の立ち上げ指令を行う（図２Ｂ）。第１の副電子機器１６Ａへの電源が正しく供給されたとき、つまり第１の副電子機器１６Ａの信号処理系３８およびハードディスク装置３２に対してＤＣ電源が供給されたときには、第１の副電子機器１６Ａからその確認信号が通信ケーブル３９ａを介して制御部２０に戻される（図２Ｃ）。

【００３１】制御部２０がこの確認信号を認識すると、次に第２の副電子機器１６Ｂに対して通信ケーブル３９ｂを介して電源の立ち上げ指令を行う（図２Ｄ）。そして、同様に第２の副電子機器１６Ｂの信号処理系およびハードディスク装置に対してＤＣ電源が供給されたときには、第２の副電子機器１６Ｂからその確認信号が通信ケーブル２９ｂを介して制御部２０に戻される（図２Ｅ）。以後同様な処理が全ての副電子機器１６に対して行われる。

【００３２】このように、電源の立ち上げタイミングを順次ずらしながら、副電子機器１６に対する電源供給を行うと、主電源部１４の副電子機器１６に対する電源投入時におけるピーク電流Ｉは、副電子機器１６の定常電力をＰとし、主電子機器１２に接続された副電子機器１６の台数をｎとし、一台分の差分ピーク電力をΔＰとしたとき、

$$I = n \cdot P \cdot \Delta P \quad \cdots\cdots (1)$$

となる。ここに、差分ピーク電力ΔＰは、ピーク電力をＰpeakとするとき、

$$\Delta P = P_{peak} - P$$

である。このように電源立ち上げタイミングをずらさないで、同時にｎ台の副電子機器１６に電源を供給したとすると、そのとき主電源部１４のピーク電流Ｉ’は、

$$I' = n \cdot P_{peak} \quad \cdots\cdots (2)$$

となる。

【００３３】ピーク電力Ｐpeakは突入電流などが流れる関係で、通常電力Ｐの数倍程度であるから、電源立ち上げのシフトを行うことによって、同時立ち上げよりも、主電源部１４の負担を遙かに軽減できることが判る。それに伴って、主電源部１４も小型のものを使用でき、装置の小型化にも寄与する。

【００３４】図３は主電子機器１２における上述した電源の立ち上げ制御処理を行うときのフローチャートである。主電子機器１２に対して外部から電源を立ち上げる指示があると、主電源の立ち上げが行われ、必要な部署に所定のＤＣ電源が印加される（ステップ５１，５２）。したがって内蔵されたハードディスク装置２２にも駆動電源として供給され、その駆動モータも立ち上げられる。

【００３５】電源が立ち上げられてから所定の時間ｔｏ

が経過すると（ステップ５３）、主電子機器１２は安定した正常状態となるから、この所定時間経過後に、副電子機器１６ｉ（ｉ＝１，２，・・・）に対して電源の立ち上げ指示を行う（ステップ５４）。そして、電源立ち上げ指示を行った副電子機器１６ｉからの確認信号を待つ（ステップ５５）。

【００３６】確認信号が得られたときにはその副電子機器１６ｉは、電源が安定した状態になっていることを示すものであるから、この場合には全ての副電子機器１６ｉに対して電源立ち上げ指示を行ったかどうかを確認し（ステップ５６）、そうでないときには電源立ち上げ指示を行う値ｉをインクリメントして（ステップ５７）、ステップ５４から同様な電源立ち上げ処理を行う。そして全ての副電子機器１６に対する電源立ち上げが終了することでこの電源立ち上げ処理が終わる。

【００３７】上述した実施の形態では副電子機器１６からの確認信号を待って次の副電子機器１６への電源立ち上げを指示したが、これの代わりに所定時間Ｔを設定し、所定時間Ｔが経過したとき次の副電子機器１６に対して電源立ち上げ指示を行うようにしてもよい。

【００３８】

【発明の効果】以上説明したようにこの発明に係る電子機器では、複数の副電子機器に電源を供給する場合、その電源供給タイミングを順次ずらして供給するようにしたものである。また、この発明に係る電子機器では、主電源部を持たずに外部よりＤＣ電源の供給を受けられるようにしたものである。これによれば、主電子機器に設けられた主電源部の電源容量を差ほど大きくすることなく、複数の副電子機器に対して電源特にＤＣ電源を供給でき、それに伴って主電子機器の小型化およびコストダウンを図れる実益を有する。

【００３９】副電子機器にはスイッチングレギュレータなどのＡＣ－ＤＣコンバータなどが不要になるから、副電子機器にあっても一層の小型化およびコストダウンを図れる実益を有する。

【００４０】したがってこの発明は複数の副電子機器に対してＤＣ電源を供給できるように構成された据え置き型であって、記録媒体を内蔵した記録再生装置などの電子機器に適用して極めて好適である。

【図面の簡単な説明】

【図１】この発明に係る電子機器を適用した使用例を示すブロック図である。

【図２】動作状態を示す波形図である。

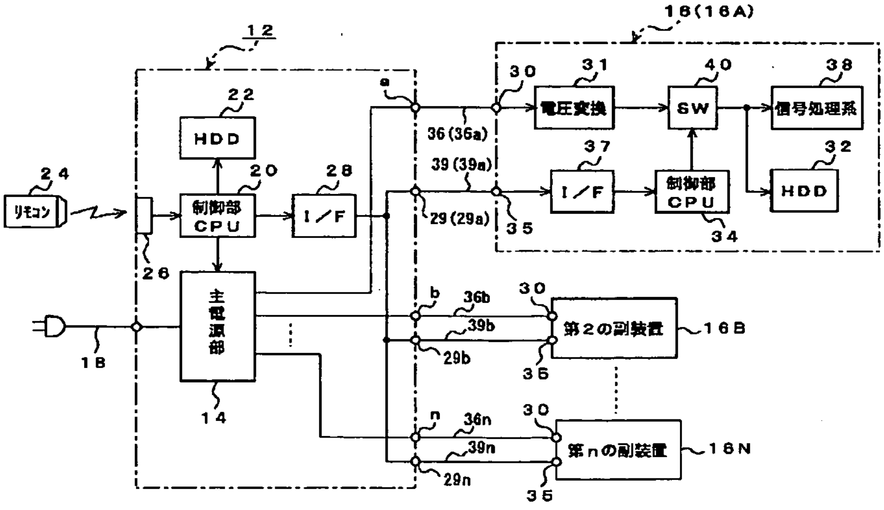
【図３】電源制御例を示すフローチャートである。

【図４】従来の使用例を示すブロック図である。

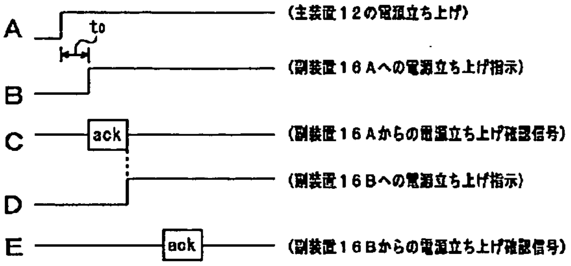
【符号の説明】

１２	主電子機器
１４	主電源部
１６	副電子機器
２０，３４	制御部
２２，３２	ハードディスク装置
２８	インタフェース部
２９	通信ケーブル
３１	ＤＣ変換部
３６	電源ケーブル
３８	信号処理系
４０	スイッチング手段

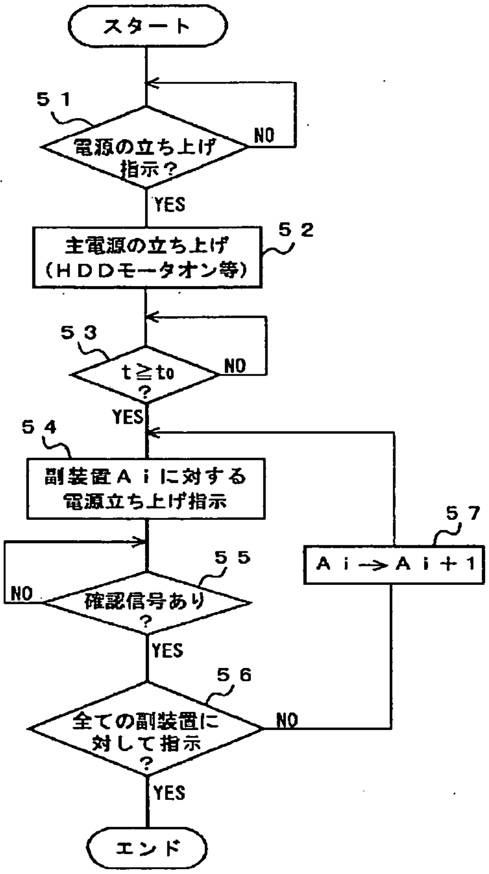
【図１】



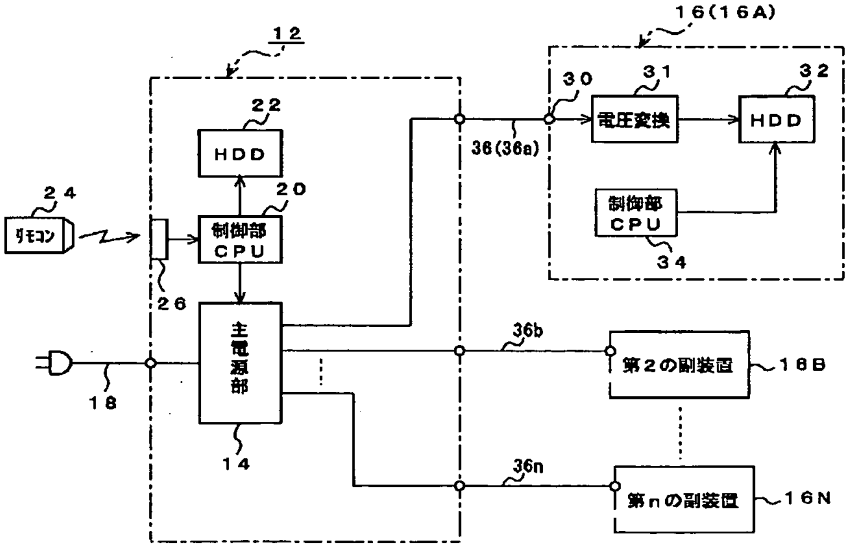
【図２】


A
t0
B
C
ack
D
E
ack
（主装置１２の電源立ち上げ）
（副装置１６Ａへの電源立ち上げ指示）
（副装置１６Ａからの電源立ち上げ確認信号）
（副装置１６Ｂへの電源立ち上げ指示）
（副装置１６Ｂからの電源立ち上げ確認信号）

【図３】


スタート
５１
電源の立ち上げ指示？
NO
YES
主電源の立ち上げ（ＨＤＤモータオン等）
５２
５３
t≧t0？
NO
YES
５４
副装置Ａｉに対する電源立ち上げ指示
５７
Ａｉ→Ａｉ＋１
５５
確認信号あり？
NO
YES
５６
全ての副装置に対して指示？
NO
YES
エンド

【図４】


１２
２２
ＨＤＤ
２０
制御部
ＣＰＵ
２４
リモコン
２６
主電源部
１４
１８
１６（１６Ａ）
３０
３１
電圧変換
３２
ＨＤＤ
３６（３６a）
制御部
ＣＰＵ
３４
36b
第２の副装置
１８Ｂ
36n
第ｎの副装置
１６Ｎ

フロントページの続き

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GA04 JA07 KA02 MA07

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(71)Applicant : HITACHI LTD
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FUKUDA YUICHI

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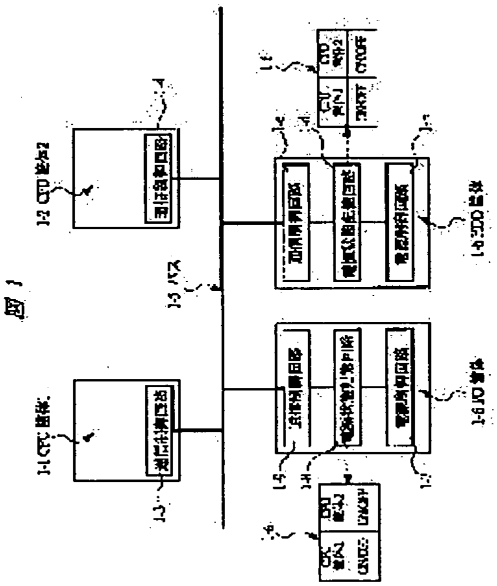
(54) ELECTRIC POWER SUPPLY CONTROLLER

(57)Abstract:

PROBLEM TO BE SOLVED: To control exactly the supply of power of interdependent enclosures of an information processing unit that consists of plural connected enclosures regardless of number and combination of enclosures.

SOLUTION: In an information processing unit that makes up a system by connecting of plural enclosures including CPU enclosures 1 and 2, an I/O enclosure 1-6, and a HDD enclosure 1-b, the supply of power is controlled efficiently for peripheral device enclosures including an I/O enclosure 1-6 that is dependent on power supply condition of CPU enclosure 1 and 2, and a HDD enclosure 1-b by installation of a bus 1-5 that connects each enclosure to be connected, communication control circuits 1-3, 1-4, 1-9 and 1-e that are workable under the off status of power supply (standby status of power supply), the power supply status memory circuits 1-8 and 1-d that can store the power supply information on the enclosures other than itself collected by communication control circuits 1-9 and 1-e, and power control circuits 1-7 and 1-c.



LEGAL STATUS

[Date of request for examination]

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[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision

of rejection]
[Date of requesting appeal against examiner's decision of rejection]
[Date of extinction of right]

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特開2002−6998

（P2002−6998A）

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(51)Int.Cl.⁷	識別記号	F I	テーマコート゛(参考)
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H02J　1/00	308	G06F　1/00　334P	5G065

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弁理士　筒井　大和

最終頁に続く

(54)【発明の名称】　電源制御装置

(57)【要約】

【課題】　複数の筐体を接続した構成の情報処理装置において、筐体の数量や組み合わせ等に関係なく、依存関係にある筐体間の電源制御を的確に行う。

【解決手段】　ＣＰＵ筐体１、２やＩ／Ｏ筐体１−６、ＨＤＤ筐体１−ｂ等の複数の筐体を接続して一つのシステムを構築する情報処理装置において、接続される各筐体間を接続するバス１−５、電源ＯＦＦ状態（スタンバイ電源状態）で動作可能な通信制御回路１−３、１−４、１−９、１−ｅ、バス１−５を介して通信制御回路１−９、１−ｅが収集した自装置以外の筐体の電源情報等を記憶できる電源状態記憶回路１−８、１−ｄ、電源制御回路１−７、１−ｃを設け、ＣＰＵ筐体１、２の電源状態に依存するＩ／Ｏ筐体１−６、ＨＤＤ筐体１−ｂ等の周辺機器筐体の電源制御を効率良く行なう。

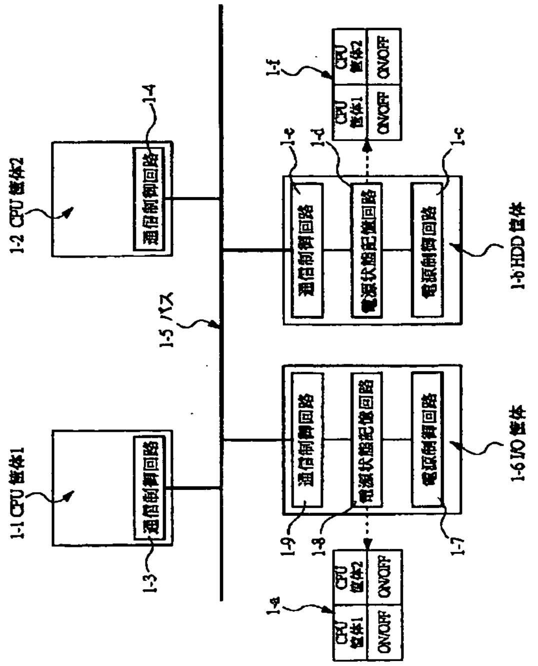


図1

【特許請求の範囲】

【請求項１】　少なくとも一つの上位装置と、前記上位装置の支配下で稼働する少なくとも一つの周辺装置とを接続する情報伝送路と、
個々の前記上位装置および前記周辺装置に設けられ、当該上位装置および周辺装置の各々における電源投入／切断に関係なく動作し、前記上位装置の稼働状態情報を前記情報伝送路を経由して前記周辺装置に伝達する通信制御手段と、
個々の前記周辺装置に設けられ、当該周辺装置の各々における電源投入／切断に関係なく動作し、前記上位装置の前記稼働状態情報に基づいて、当該周辺装置の各々における電源投入および電源切断を制御する電源制御手段と、
を含むことを特徴とする電源制御装置。

【請求項２】　請求項１記載の電源制御装置において、
前記上位装置の前記稼働状態情報は、前記上位装置における電源投入および電源切断の電源状態を示す第１の情報と、前記上位装置が正常動作か否かの動作状態を示す第２の情報の少なくとも一方の情報を含むことを特徴とする電源制御装置。

【請求項３】　請求項１記載の電源制御装置において、
個々の前記上位装置の前記通信制御手段が、任意の契機で、当該上位装置における前記稼働状態情報を収集して前記周辺装置の前記通信制御手段に通知する動作を行うことを特徴とする電源制御装置。

【請求項４】　請求項１記載の電源制御装置において、
個々の前記周辺装置の前記通信制御手段が、任意の契機で前記上位装置の前記通信制御手段に働きかけて当該上位装置の前記稼働状態情報を収集する動作を行うことを特徴とする電源制御装置。

【請求項５】　請求項１，２，３または４記載の電源制御装置において、
前記情報伝送路に接続される複数の前記上位装置および前記周辺装置は、各々がすくなくとも一つの前記上位装置および前記周辺装置を含むグループを構成し、個々の前記グループにおいて互いに独立に、当該グループ内における前記上位装置の前記稼働状態情報に基づく前記周辺装置の電源投入および電源切断の制御が実行されることを特徴とする電源制御装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、電源制御技術に関し、特に、複数の筐体からなる情報処理装置における各筐体の電源制御や、一つのシステム内に複数のＣＰＵ筐体をもつクラスタシステムにおける周辺機器筐体の電源制御等に適用して有効な技術に関する。

【０００２】

【従来の技術】一つまたは複数のＣＰＵ筐体の配下に複数の周辺機器筐体を接続して構成される情報処理システムでは、個々のＣＰＵ筐体の電源のＯＮ／ＯＦＦと、配下の周辺機器筐体の電源のＯＮ／ＯＦＦ操作を連動させて制御することが、システムの運用管理の効率化、自動化、さらにはシステム全体の消費電力低減等の観点から重要となる。

【０００３】従来、たとえば特開平１１－２１２６８２号公報には、情報処理装置の本体の内部に、周辺装置の電源のＯＮ／ＯＦＦに連動して当該本体の電源のＯＮ／ＯＦＦ、他の周辺装置の電源のＯＮ／ＯＦＦを実行する電源連動用モジュールを備えた電源制御方式が開示されている。

【０００４】また、特開平６－２３６２２６号公報には、ホストコンピュータと周辺機器とを接続するＳＣＳＩケーブル等のインタフェース信号の状態によって、ホストコンピュータの電源のＯＮ／ＯＦＦを判断して、周辺機器の電源のＯＮ／ＯＦＦを連動させる技術が開示されている。

【０００５】

【発明が解決しようとする課題】上述の各従来技術では、本体装置が一つの場合を想定しており、クラスタシステムの様に本体装置が複数台存在する場合には、いずれも対応できないという技術的課題がある。

【０００６】また、後者の従来技術では、インタフェース信号の状態によって接続装置の電源のＯＮ／ＯＦＦ判断するため、ノイズや電圧の回り込みにより、インターフェイス信号の本来の機能が誤動作する可能性が生じるという技術的課題があった。特に、インターフェイス信号としてＳＣＳＩバスの終端電圧を使用する場合、従来の非同期型のバスに対して、近年の高速（８０ＭＢ／秒や１６０ＭＢ／秒）な転送レートを実現しようとすると、終端電圧もノイズ等に対して敏感になっており、終端抵抗の駆動電圧を電源状態の判別に利用することが、ますます実現困難になることが予想される。

【０００７】本発明の目的は、システムを構成する上位装置や周辺装置の台数や組み合わせ等に関係なく、上位装置および周辺装置の連動した電源投入／切断の制御を的確に行うことが可能な電源制御技術を提供することにある。

【０００８】本発明の他の目的は、上位装置と周辺装置との間の本来の接続インターフェイスの信頼性を低下させることなく、上位装置および周辺装置の連動した電源投入／切断の制御を的確に行うことが可能な電源制御技術を提供することにある。

【０００９】

【課題を解決するための手段】本発明の電源制御装置は、少なくとも一つの上位装置と、上位装置の支配下で稼働する少なくとも一つの周辺装置とを接続する情報伝送路と、個々の上位装置および周辺装置に設けられ、当該上位装置および周辺装置の各々における電源投入／切断に関係なく動作し、上位装置の稼働状態情報を情報伝

送路を経由して周辺装置に伝達する通信制御手段と、個々の周辺装置に設けられ、当該周辺装置の各々における電源投入／切断に関係なく動作し、上位装置の稼働状態情報に基づいて、当該周辺装置の各々における電源投入および電源切断を制御する電源制御手段と、を含むものである。

【００１０】より具体的には、接続される各筐体間を接続する複数の信号から構成されるバス、各筐体の電源ＯＦＦ状態（スタンバイ電源状態）で動作可能な通信制御回路、自装置以外の筐体の電源情報等を記憶できる電源状態記憶回路、自筐体の電源のＯＮ／ＯＦＦを行う電源制御回路を備えたものである。

【００１１】

【発明の実施の形態】以下、本発明の実施の形態を図面を参照しながら詳細に説明する。

【００１２】図１は、本発明の一実施の形態である電源制御装置を備えた情報処理システムの構成の一例を示すブロック図、図２は、本実施の形態の電源制御装置における作用の一例を示す説明図、図３は、本発明の一実施の形態である電源制御装置を備えた情報処理システムの構成の変形例を示すブロック図、図４は、図３の変形例の作用の一例を示す説明図、図５は、本発明の一実施の形態である電源制御装置を備えた情報処理システムの構成の変形例を示すブロック図である。

【００１３】図１の構成において、１－１はＣＰＵ筐体１であり、電源ＯＦＦ状態（スタンバイ電源状態）で動作可能な通信制御回路１－３を具備し、複数の信号から構成されるバス１－５によってＣＰＵ筐体２（１－２）、Ｉ／Ｏ筐体１－６、ＨＤＤ筐体１－ｂと接続される。

【００１４】ＣＰＵ筐体２（１－２）は電源ＯＦＦ状態（スタンバイ電源状態）で動作可能な通信制御回路１－４を具備している。ＣＰＵ筐体１（１－１）とＣＰＵ筐体２（１－２）はクラスタ構成である。

【００１５】Ｉ／Ｏ筐体１－６は電源ＯＦＦ状態（スタンバイ電源状態）で動作可能な通信制御回路１－９を具備し、ＣＰＵ筐体１（１－１）、ＣＰＵ筐体２（１－２）の電源状態情報１－ａを記憶できる電源状態記憶回路１－８、当該Ｉ／Ｏ筐体１－６の電源をＯＮ／ＯＦＦすることのできる電源制御回路１－７から構成される。

【００１６】ＨＤＤ筐体１－ｂは電源ＯＦＦ状態（スタンバイ電源状態）で動作可能な通信制御回路１－ｅを具備し、ＣＰＵ筐体１（１－１）、ＣＰＵ筐体２（１－２）の電源状態情報１－ｆを記憶できる電源状態記憶回路１－ｄ、当該ＨＤＤ筐体１－ｂの電源をＯＮ／ＯＦＦすることのできる電源制御回路１－ｃから構成される。

【００１７】図１に示すクラスタシステムにおいて、ＣＰＵ筐体１（１－１）およびＣＰＵ筐体２（１－２）と、配下のＩ／Ｏ筐体１－６およびＨＤＤ筐体１－ｂは、たとえば、上述のバス１－５とは別に設けられた図示しない接続インターフェイスにて相互に接続され、相互にデータのやり取りを行うことで、連携して所望の情報処理動作を遂行する。

【００１８】このため、ＣＰＵ筐体１（１－１）、ＣＰＵ筐体２（１－２）のどちらか一つのＣＰＵ筐体に電源が入っていれば、それに接続されるＩ／Ｏ筐体１－６、ＨＤＤ筐体１－ｂの様な周辺機器筐体は連携動作可能なように電源を入れておかなければならない。以下にその制御方法について説明する。

【００１９】まず、ＣＰＵ筐体の側から自発的に自筐体の電源状態を周辺装置側に通知する、ＣＰＵ筐体主導方式による電源制御方法ついて図１を用いて説明する。

【００２０】ＣＰＵ筐体１（１－１）は、自筐体の電源（５Ｖ／１２Ｖなど）状態が変化した時に、通信制御回路１－３を用い、バス１－５を介してＩ／Ｏ筐体１－６内の通信制御回路１－９と、ＨＤＤ筐体１－ｂ内の通信制御回路１－ｅに電源情報を通知する。ＣＰＵ筐体２（１－２）も同様に自分の電源（５Ｖ／１２Ｖなど）状態が変化した時に、通信制御回路１－４を用い、バス１－５を介してＩ／Ｏ筐体１－６内の通信制御回路１－９と、ＨＤＤ筐体１－ｂ内の通信制御回路１－ｅに電源情報を通知する。

【００２１】Ｉ／Ｏ筐体１－６は、通信制御回路１－９に通達された情報を電源状態記憶回路１－８に電源状態を電源状態情報１－ａの様に記憶させる。電源制御回路１－７は電源状態情報１－ａによって図２に例示する電源制御条件に基づいて、ＣＰＵ筐体１（１－１）、ＣＰＵ筐体２（１－２）の両ＣＰＵ筐体が電源ＯＦＦの状態から、どちらか片方もしくは両ＣＰＵ筐体の電源がＯＮされた場合に、当該Ｉ／Ｏ筐体１－６の電源をＯＦＦ→ＯＮさせ、またＣＰＵ筐体１（１－１）、ＣＰＵ筐体２（１－２）のどちらか片方もしくは両ＣＰＵ筐体が電源ＯＮの状態から、両ＣＰＵ筐体の電源がＯＦＦされた場合に、当該Ｉ／Ｏ筐体１－６の電源をＯＮ→ＯＦＦさせる。

【００２２】ＨＤＤ筐体１－ｂもＩ／Ｏ筐体１－６と同様に通信制御回路１－ｅに通達された情報を電源状態記憶回路１－ｄに電源状態を電源状態情報１－ｆの様に記憶させる。電源制御回路１－ｃは電源状態情報１－ｆによって、図２に示す電源制御条件に従って、ＣＰＵ筐体１（１－１）、ＣＰＵ筐体２（１－２）の両ＣＰＵ筐体が電源ＯＦＦの状態から、どちらか片方もしくは両ＣＰＵ筐体の電源がＯＮされた場合に、当該ＨＤＤ筐体１－ｂの電源をＯＦＦ→ＯＮさせ、またＣＰＵ筐体１（１－１）、ＣＰＵ筐体２（１－２）のどちらか片方もしくは両ＣＰＵ筐体が電源ＯＮの状態から、両ＣＰＵ筐体の電源がＯＦＦされた場合に、当該ＨＤＤ筐体１－ｂの電源をＯＮ→ＯＦＦさせる。

【００２３】次に周辺機器が主導でＣＰＵ筐体の状態情報を収集する場合の電源制御例について説明する。

【００２４】Ｉ／Ｏ筐体１－６は、定期的に、あるいは任意の契機で、バス１－５を介してＣＰＵ筐体１（１－１）内の通信制御回路１－３と、ＣＰＵ筐体２（１－２）内の通信制御回路１－４にアクセスして、ＣＰＵ筐体１（１－１）、ＣＰＵ筐体２（１－２）の電源状態の情報を収集する。

【００２５】ＨＤＤ筐体１－ｂも同様に、定期的に、あるいは任意の契機で、バス１－５を介してＣＰＵ筐体１（１－１）内の通信制御回路１－３とＣＰＵ筐体２（１－２）内の通信制御回路１－４から電源状態の情報を収集する。

【００２６】Ｉ／Ｏ筐体１－６は、通信制御回路１－９に収集したＣＰＵ筐体１（１－１）、ＣＰＵ筐体２（１－２）の電源状態を電源状態情報１－ａの様に記憶する。電源制御回路１－７は電源状態情報１－ａによって図２に示す制御条件にて、ＣＰＵ筐体１（１－１）、ＣＰＵ筐体２（１－２）の両ＣＰＵ筐体が電源ＯＦＦの状態から、どちらか片方もしくは両ＣＰＵ筐体の電源がＯＮされていた場合に、当該Ｉ／Ｏ筐体１－６の電源をＯＦＦ→ＯＮさせ、またＣＰＵ筐体１（１－１）、ＣＰＵ筐体２（１－２）の両ＣＰＵ筐体が電源ＯＮの状態から、両ＣＰＵ筐体の電源がＯＦＦされていた場合にＩ／Ｏ筐体１－６の電源をＯＮ→ＯＦＦする。

【００２７】ＨＤＤ筐体１－ｂもＩ／Ｏ筐体１－６と同様に収集した電源状態を電源状態情報１－ｆの様に記憶し、電源制御回路１－ｃは電源状態情報１－ｆによって図２に示す通り、当該ＨＤＤ筐体１－ｂの電源ＯＮ／ＯＦＦを制御する。

【００２８】これらの、ＣＰＵ筐体主導、あるいは周辺装置主導によるＣＰＵ筐体の電源状態の情報の収集およびそれに連動した周辺装置の電源制御により、クラスタシステムにおいて必要条件を効率良く満たす電源制御が実現できる。

【００２９】次に、周辺装置の電源制御に用いられる、ＣＰＵ筐体側の状態情報の種類を一つ増やした場合について図３を用いて説明する。例えば、電源情報の他に、ＣＰＵ筐体の動作情報ＯＫ／ＮＧという情報を追加する。動作情報ＯＫはＣＰＵ筐体の動作が正常な状態を示し、動作情報ＮＧはＣＰＵ筐体が動作不能な異常状態（ＣＰＵのハングアップ、等）を示す。

【００３０】ＣＰＵ筐体の動作情報ＯＫ／ＮＧを追加した場合、図１の構成との相違点として、Ｉ／Ｏ筐体１－ｇは電源ＯＦＦ状態（スタンバイ電源状態）で動作可能なＣＰＵ筐体１（１－１）、ＣＰＵ筐体２（１－２）の電源状態及び動作状態からなる電源／動作状態情報１－ｉを記憶できる電源／動作状態記憶回路１－ｈを具備し、ＨＤＤ筐体１－ｊはＣＰＵ筐体１（１－１）、ＣＰＵ筐体２（１－２）の電源状態及び動作状態からなる電源／動作状態情報１－ｌを記憶できる電源／動作状態記憶回路１－ｋから構成される。

【００３１】前述した様に、クラスタシステムにおいて、ＣＰＵ筐体が一つでも電源ＯＮの状態であれば、そのシステムに接続される周辺機器筐体は電源ＯＮしていなければならない。しかし、電源ＯＮしているＣＰＵ筐体がハングアップなどを起こし動作ＮＧであれば、周辺機器筐体の電源はＯＮしていても消費電力の無駄であり、電源ＯＦＦした方が効率がよい。以下にその制御方法について説明する。

【００３２】ＣＰＵ筐体１（１－１）は、自分の電源状態が変化した場合や動作状態が変化した時に通信制御回路１－３を用い、バス１－５を介してＩ／Ｏ筐体１－ｇ内の通信制御回路１－９と、ＨＤＤ筐体１－ｊ内の通信制御回路１－ｅに、自ＣＰＵ筐体の電源情報と動作情報を通知する。ＣＰＵ筐体２（１－２）も同様に電源情報と動作情報を通知する。

【００３３】Ｉ／Ｏ筐体１－ｇは通信制御回路１－９に通知された情報を電源／動作状態記憶回路１－ｈに電源状態及び動作状態を電源／動作状態情報１－ｉの様に記憶させる。電源制御回路１－７は電源／動作状態情報１－ｉによって図４に示す通り、ＣＰＵ筐体の一つ以上が電源ＯＮされ、かつ動作ＯＫの場合にのみ、周辺機器筐体（当該Ｉ／Ｏ筐体１－ｇ）の電源をＯＦＦ→ＯＮさせ、また全てのＣＰＵ筐体がＯＦＦされるか、もしくはＯＮされているＣＰＵ筐体の動作状態がＮＧであればＯＮ→ＯＦＦさせる。

【００３４】ＨＤＤ筐体１－ｊもＩ／Ｏ筐体１－ｇと同様に各ＣＰＵ筐体から通知された電源情報と動作情報を電源／動作状態情報１－ｌの様に記憶し、電源制御回路１－ｃは電源／動作状態情報１－ｌによって図４に示す通り、当該ＨＤＤ筐体１－ｊの電源ＯＮ／ＯＦＦを制御する。

【００３５】上の説明では、ＣＰＵ筐体の側から自発的に、周辺装置の側に、自ＣＰＵ筐体の電源情報および動作情報を通知して電源制御を行わせる場合を例示しているが、先に例示した図１の場合の様に、周辺機器の側から任意の契機で、各ＣＰＵ筐体の電源情報および動作情報を収集して、自周辺機器の電源のＯＮ／ＯＦＦを制御することもできる。

【００３６】次に複数のグループ化されたシステムの場合における電源制御ついて図５を用いて説明する。バス１－５上に例えば２つのグループが存在した場合、グループ１は、ＣＰＵ筐体１（１－１）とＩ／Ｏ筐体１－６、ＨＤＤ筐体１（１－ｂ）の構成でバス１－５で接続されおり、グループ２は、ＣＰＵ筐体２（１－２）、ＣＰＵ筐体３（１－ｍ）とＨＤＤ筐体２（１－ｎ）の構成でグループ１と同じバス１－５で接続されている。

【００３７】グループ１のＣＰＵ筐体１（１－１）は、自分の電源状態が変化した時に、自グループ１に属するＩ／Ｏ筐体１－６とＨＤＤ筐体１（１－ｂ）にのみ電源情報を通知し、他のグループ２に属するＨＤＤ筐体２

（１－ｎ）へは通知しない。

【００３８】グループ２のＣＰＵ筐体２（１－２）とＣＰＵ筐体３（１－ｍ）は、それぞれ自分の電源状態が変化した時に、自グループ２に属するＨＤＤ筐体２（１－ｎ）にのみ電源情報を通知し、他のグループ１に属するＩ／Ｏ筐体１－６とＨＤＤ筐体１（１－ｂ）へは通知しない。

【００３９】グループ１のＩ／Ｏ筐体１－６とＨＤＤ筐体１（１－ｂ）は、通知された自グループ１内のＣＰＵ筐体１（１－１）の電源情報をもとに、上述の図２（電源情報と動作情報の二つを用いる場合は図４）の条件により自筐体の電源ＯＮ／ＯＦＦを制御する。

【００４０】グループ２のＨＤＤ筐体２（１－ｎ）は、通知された自グループ２内のＣＰＵ筐体２（１－２）、ＣＰＵ筐体３（１－ｍ）の電源情報をもとに図２（電源情報と動作情報の二つを用いる場合は図４）の条件により自筐体の電源ＯＮ／ＯＦＦを制御する。

【００４１】上記の様に、同一のバス１－５上に接続された複数のグループ１およびグループ２からなるシステムにおいても、必要なシステムにのみ情報を通知することにより、グループ毎に別々の電源制御を実現することができる。

【００４２】複数のグループ化されたシステムにおいても、図１で説明した実施の形態の様に、前述のＣＰＵ筐体主導方式や周辺機器主導方式で実現することができる。

【００４３】本実施の形態では以上の様に、周辺装置の電源制御に用いられるＣＰＵ筐体側の情報の例として、電源情報と動作情報を用いる場合例示したが、情報量には制限は無い。即ち、周辺機器筐体の電源ＯＮ／ＯＦＦに関わる情報、バスのスペックについては言及していない。また、ＣＰＵ筐体の数についても言及していない。

【００４４】すなわち、ＣＰＵ筐体内情報はＣＰＵ筐体内電源情報のみでも構わないし、ＣＰＵ筐体内で筐体内情報により周辺機器筐体の電源ＯＮ／ＯＦＦを判定しても構わない。また、いろいろなＣＰＵ筐体情報を周辺機器筐体内で解析等を行い、各々周辺機器に合わせた電源ＯＮ／ＯＦＦの判定をしても構わない。

【００４５】また、ＣＰＵ筐体内に、電源状態記憶回路や電源制御回路を配置し、Ｉ／Ｏ筐体やＨＤＤ筐体等の周辺装置側の電源状態に応じて、ＣＰＵ筐体側の電源のＯＮ／ＯＦＦを制御してもよい。また、Ｉ／Ｏ筐体やＨＤＤ筐体等の周辺装置の間で相互に電源状態に依存関係がある場合には、その依存関係に従った電源制御をおこなってもよいことはいうまでもない。

【００４６】また、本実施の形態を応用すればマネージャコンソールからのシステムＯＮ／ＯＦＦも可能である。即ち上記ＯＮ／ＯＦＦ制御から独立した（常時ＯＮ）の図示しないマネージャコンソール（筐体）をバス１－５に接続し、該コンソールからＯＮ／ＯＦＦ命令をバス１－５を介して発行する事により、システム全体の電源ＯＮ／ＯＦＦの制御を簡単に実施できる。

【００４７】以上説明したように、本実施の形態の電源制御技術を用いれば、ＣＰＵ筐体、Ｉ／Ｏ筐体、ＨＤＤ筐体等の複数の筐体を接続して一つのシステムを構築する情報処理装置において、ＣＰＵ筐体が何個あっても、あるいはいかなる組み合わせ状態であっても、Ｉ／Ｏ筐体、ＨＤＤ筐体等の周辺機器筐体の電源制御を効率よく行なうことが可能となる。

【００４８】また、電源制御に用いられる情報のやりとりは、専用のバス１－５を用いるので、通常のデータの授受等に用いられる接続インターフェイスを兼用する場合のように、当該接続インターフェイスの誤動作等の信頼性の低下の懸念もない。

【００４９】本願の特許請求の範囲に記載された発明を見方を変えて表現すれば以下の通りである。

【００５０】＜１＞　ＣＰＵ筐体、周辺機器筐体等の複数の筐体を接続して構築しているシステムにおいて、システム内の筐体をそれぞれ複数の信号から構成されるバスで接続し、そのバスを介して情報の交換を可能とし、各筐体共電源ＯＦＦ状態（スタンバイ電源状態）で動作可能な通信制御回路を具備し、ＣＰＵ筐体がＣＰＵ筐体に接続される他筐体に対し電源状態を通知することにより電源ＯＮ／ＯＦＦを制御することを特徴とする電源制御方式。

【００５１】＜２＞　項目＜１＞記載の電源制御方式において、周辺機器筐体がＣＰＵ筐体の電源状態を記憶でき、電源ＯＦＦ状態（スタンバイ電源状態）で動作可能な電源状態記憶回路を具備し、ＣＰＵ筐体は自分の電源（５Ｖ／１２Ｖ等）状態が変化した場合、接続されている周辺機器筐体に対し新たな電源状態をバスを介して通知し、周辺機器筐体の通信制御記憶回路は、バスから送られてきた情報をもとに、電源状態記憶回路内の該ＣＰＵ筐体の情報を更新し、その情報より周辺機器筐体の電源ＯＮ／ＯＦＦを制御することを特徴とする電源制御方式。

【００５２】＜３＞　項目＜１＞記載の電源制御方式において、同一バス上に接続された複数のＣＰＵ筐体と周辺機器筐体で複数のグループ化されたシステムにおいて、グループ毎にＣＰＵ筐体が主導となり、グループ化された他筐体に対し電源状態を通知し、グループ毎に別々の電源ＯＮ／ＯＦＦを制御することを特徴とする電源制御方式。

【００５３】＜４＞　項目＜２＞記載の電源制御方式において、周辺機器筐体はＣＰＵ筐体から送られてきた情報をもとに、電源状態記憶回路の情報から、少なくとも一つのＣＰＵ筐体の電源がＯＮ状態であれば自分の電源をＯＮ状態に保ち、全てのＣＰＵ筐体の電源がＯＦＦ状態であれば、自分の電源をＯＦＦ状態に保つよう制御することを特徴とする電源制御方式。

【００５４】＜５＞　項目＜２＞記載の電源制御方式において、ＣＰＵ筐体の電源情報以外の情報（例えば、電源は入っているが、システム内ＣＰＵ筐体がすべてハングアップしている）を持ち、ＣＰＵ筐体内で自筐体における周辺機器筐体電源ＯＮの必要の有無を判定し、周辺機器筐体に対して通知することにより周辺機器筐体の電源ＯＮ／ＯＦＦを制御することを特徴とする電源制御方式。

【００５５】＜６＞　ＣＰＵ筐体、周辺機器筐体の複数の筐体を接続して構築しているシステムにおいて、システム内の筐体をそれぞれ複数の信号から構成されるバスで接続し、そのバスを介して情報の交換を可能とし、各筐体共電源ＯＦＦ状態（スタンバイ電源状態）で動作可能な通信制御回路を具備し、周辺機器筐体がＣＰＵ筐体の電源情報をバスを介して収集し、得た情報をもとに周辺機器筐体の電源ＯＮ／ＯＦＦを制御することを特徴とする電源制御方式。

【００５６】＜７＞　項目＜６＞記載の電源制御方式において、周辺機器筐体がＣＰＵ筐体の電源状態を記憶でき、電源ＯＦＦ状態（スタンバイ電源状態）で動作可能な電源状態記憶回路を具備し、周辺機器筐体が定期的に自分に接続されているＣＰＵ筐体の電源状態の情報をバスを介して収集し、得た情報をもとに、電源状態記憶回路内の該ＣＰＵ筐体の情報を更新し、その情報より周辺機器筐体の電源ＯＮ／ＯＦＦを制御することを特徴とする電源制御方式。

【００５７】＜８＞　項目＜６＞記載の電源制御方式において、同一バス上に接続された複数のＣＰＵ筐体と周辺機器筐体で複数のグループ化されたシステムにおいて、グループ毎に周辺機器筐体が定期的に、グループ化されたＣＰＵ筐体の電源状態を収集し、得た情報をもとにグループ毎に別々の電源ＯＮ／ＯＦＦを制御することを特徴とする電源制御方式。

【００５８】＜９＞　項目＜７＞記載の電源制御方式において、周辺機器筐体が定期的にＣＰＵ筐体の情報を収集し、得た情報をもとに、電源状態記憶回路の情報から、少なくとも一つのＣＰＵ筐体の電源がＯＮ状態であれば自分の電源をＯＮ状態に保ち、全てのＣＰＵ筐体の電源がＯＦＦ状態であれば、自分の電源をＯＦＦ状態に保つよう制御することを特徴とする電源制御方式。

【００５９】＜１０＞　項目＜７＞記載の電源制御方式において、ＣＰＵ筐体の電源情報以外の情報（例えば、電源は入っているが、システム内ＣＰＵ筐体がすべてハングアップして動作不能に陥っているか否かの情報）を持ち、周辺機器筐体が集めた情報により解析等を行い、各々周辺機器に合わせた電源ＯＮ／ＯＦＦを制御する電源制御方式。

【００６０】以上本発明者によってなされた発明を実施の形態に基づき具体的に説明したが、本発明は前記実施の形態に限定されるものではなく、その要旨を逸脱しない範囲で種々変更可能であることはいうまでもない。

【００６１】

【発明の効果】本発明の電源制御装置によれば、システムを構成する上位装置や周辺装置の台数や組み合わせ等に関係なく、上位装置および周辺装置の連動した電源投入／切断の制御を的確に行うことができる、という効果が得られる。

【００６２】本発明の電源制御装置によれば、上位装置と周辺装置との間の本来の接続インターフェイスの信頼性を低下させることなく、上位装置および周辺装置の連動した電源投入／切断の制御を的確に行うことができる、という効果が得られる。

【図面の簡単な説明】

【図１】本発明の一実施の形態である電源制御装置を備えた情報処理システムの構成の一例を示すブロック図である。

【図２】本発明の一実施の形態である電源制御装置における作用の一例を示す説明図である。

【図３】本発明の一実施の形態である電源制御装置を備えた情報処理システムの構成の変形例を示すブロック図である。

【図４】図３の変形例の作用の一例を示す説明図である。

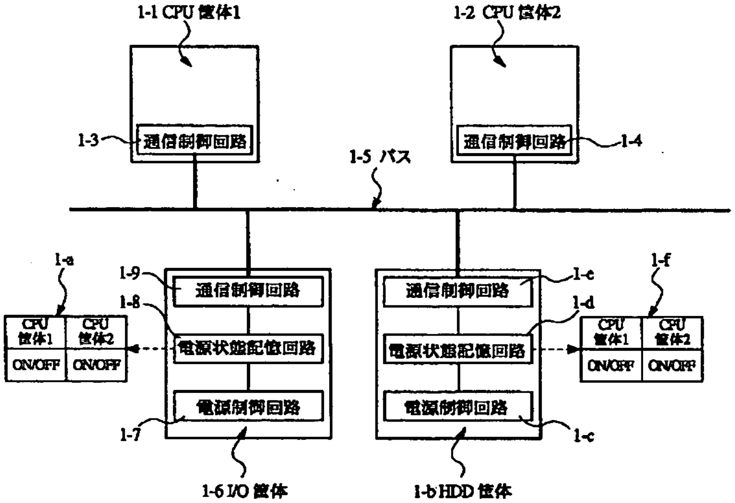
【図５】本発明の一実施の形態である電源制御装置を備えた情報処理システムの構成の変形例を示すブロック図である。

【符号の説明】

１－１…ＣＰＵ筐体１（上位装置）、１－２…ＣＰＵ筐体２、（上位装置）１－３…通信制御回路（通信制御手段）、１－４…通信制御回路（通信制御手段）、１－５…バス（情報伝送路）、１－６…Ｉ／Ｏ筐体（周辺装置）、１－７…電源制御回路（電源制御手段）、１－８…電源状態記憶回路、１－９…通信制御回路（通信制御手段）、１－ａ…電源状態情報（稼働状態情報）、１－ｂ…ＨＤＤ筐体、ＨＤＤ筐体１（周辺装置）、１－ｃ…電源制御回路（電源制御手段）、１－ｄ…電源状態記憶回路、１－ｅ…通信制御回路（通信制御手段）、１－ｆ…電源状態情報（稼働状態情報）、１－ｇ…Ｉ／Ｏ筐体（周辺装置）、１－ｈ…電源／動作状態記憶回路、１－ｉ…電源／動作状態情報（稼働状態情報）、１－ｊ…ＨＤＤ筐体（周辺装置）、１－ｋ…電源／動作状態記憶回路、１－ｌ…電源／動作状態情報（稼働状態情報）、１－ｍ…ＣＰＵ筐体３（上位装置）、１－ｎ…ＨＤＤ筐体２（周辺装置）。

【図１】

図 1



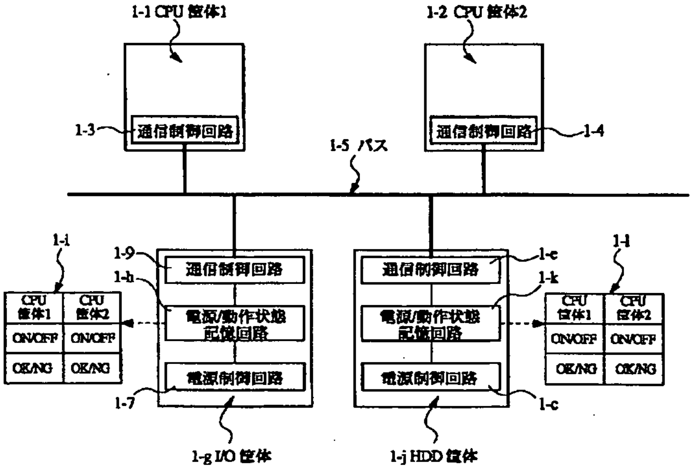
【図２】

図 2

CPU筐体1電源	CPU筐体2電源	周辺機器(I/O筐体、HDD筐体)電源
OFF	OFF	OFF
OFF	ON	ON
ON	OFF	ON
ON	ON	ON

【図３】

図 3



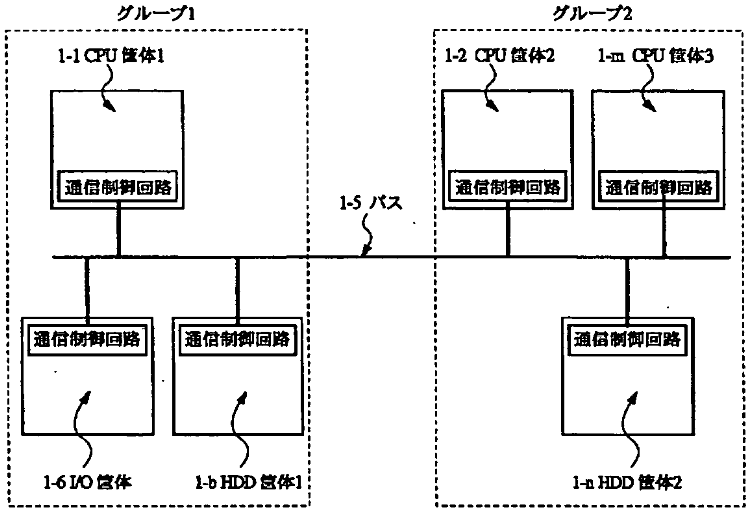
【図４】

図 4

CPU筐体1		CPU筐体2		周辺機器(I/O筐体、HDD筐体)
電源	状態	電源	状態	電源
OFF	−	OFF	−	OFF
OFF	−	ON	OK	ON
OFF	−	ON	NG	OFF
ON	OK	OFF	−	ON
ON	NG	OFF	−	OFF
ON	OK	ON	OK	ON
ON	OK	ON	NG	ON
ON	NG	ON	OK	ON
ON	NG	ON	NG	OFF

【図５】

図 5



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